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Preface

This volume contains papers written for OTA to assist in preparation of the report *An Assessment of Development and Production Potential of Federal Coal Leases.* OTA does not endorse these papers. In several instances, the OTA report reaches somewhat different conclusions because of additional information which was obtained later. These papers, however, may prove valuable for readers needing more detailed or specific information than could be accommodated in the final assessment report, and are being made available for such purposes.

An Assessment of

Development and Production Potential of Federal Coal Leases

Volume II—Working Papers

Part B: The Development Prospects for Federal Coal Leases in New Mexico, 1980-90

October 1982

CONGRESS OF THE UNITED STATES
Office of Technology Assessment
Washington, D. C. 20510

OTA WORKING PAPER B

FINAL REPORT

THE DEVELOPMENT PROSPECTS FOR FEDERAL COAL LEASES IN NEW MEXICO 1980-1990

RESULTS OF OTA NEW MEXICO COAL LEASING TASK FORCE

NOVEMBER 1981

CONGRESS OF THE UNITED STATES

OFFICE OF TECHNOLOGY ASSESSMENT

MATERIALS PROGRAM

WASHINGTON, D.C. 20510

OTA WORKING PAPER

This is an OTA Working Paper used in the preparation of OTA's final report on Federal Coal Leasing. The findings and conclusions of this report are those of the author and do not necessarily represent the views of OTA or the Technology Assessment Board. This report has not been reviewed or approved by the Technology Assessment Board.

FOREWORD

This report summarizes the results of OTA's Coal Leasing Task Force held in Santa Fe, New Mexico, in August, 1980, and OTA's assessment of the development prospects for federal coal leases in New Mexico. The report is one of several state task force reports that were prepared as part of OTA's evaluation of existing federal coal leases and preference right lease applications requested under Section 10 of the Federal Coal Leasing Amendments Act of 1976, Public Law 94-377. OTA's final report, An Assessment of Development and Production Potential of Federal Coal Leases, was published in December 1981.

As part of the evaluation process, all undeveloped federal leases were rated according to their overall prospects for development in the next decade --favorable, unfavorable, or uncertain. The ratings were based on the amount and quality of the reserves under leases, the engineering, environmental, legal, and transportation considerations affecting development, and potential markets. The task force ratings were used in conjunction with additional technical and economic analyses to estimate the potential production from existing leases in New Mexico and to identify the major factors that will influence coal development in the state.

Information for this report was drawn from a variety of sources, a draft report on the issues and uncertainties affecting New Mexico coal development prepared by James S. Cannon, OTA consultant. Dr. C. Wayne Cook, professor emeritus, Colorado State University, and member of the OTA project advisory panel, provided material on reclamation conditions in New Mexico.

Technical materials for the Task Force were prepared by Dr. Frank J. Wobber and J. Stephen Schindler of OTA. D. Keith Murray and Stanley Sutton of the Colorado School of Mines Research Institute assisted in development of New Mexico new mine profiles used in assessing each lease block.

The information and conclusions in this report were reviewed by the task force participants, the OTA coal leasing project advisory panel, and a limited number of outside reviewers. In some instances, the OTA final report, An Assessment of Development and Production Potential of Federal Coal Leases, differs from this report in the classification of some leases as undeveloped and on the amount of coal that might be produced from these leases. These differences are the result of information received after completion of the final task force report in November 1980 and do not significantly alter any of the conclusions in this report.

All comments and questions concerning this report should be addressed to Ms. Karen Larsen, Associate Project Director, Office of Technology Assessment, Materials Program, United States Congress, Washington, D. C. 20510. (202) 226-2269.

OTA WORKING PAPER

This is an OTA Working Paper used in preparation of OTA's final report on federal coal leasing. The findings and conclusions of this report are those of the author and do not necessarily represent the views of OTA or the Technology Assessment Board. This report has not been reviewed or approved by the Technology Assessment Board.

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CHAPTER 1: SUMMARY

Section 10 of the Federal Coal Leasing Amendments Act of 1976 requires OTA to evaluate the more than 500 existing coal leases and 172 pending preference right lease applications on federal land. OTA was directed to:

1. Analyze all mining activities on federal leases.
2. Determine the present and potential value of the leases.
3. Estimate potential federal revenues from the leases.
4. Examine the feasibility of using deep mining technology in leased areas.

In order to accomplish this second and third of these tasks, it must be determined which of the existing leases and PRLAs will be mined and how much coal is likely to be produced from them.

As part of its assessment, OTA conducted an independent evaluation of the development potential of all existing leases on a state-by-state basis. OTA has recently completed its review of existing federal leases in New Mexico with principle emphasis on the leases that were not in approved mine plans as of January 1, 1980. This document summarizes the results of that evaluation. State reports were also prepared for Utah, Colorado, North Dakota, and Wyoming.

Background

The 29 Federal coal leases in New Mexico cover 44,760 acres and contain more than 447 million tons of recoverable coal reserves. Three of the leases are located in the Raton coal field of northeastern New Mexico. Twenty-six leases are found in the San Juan region of northwestern New Mexico. Seven leases are currently in production as part of the existing San Juan and McKinley Mines, two large strip mining operations. One new lease was issued in April 1980 and is planned as an underground mine extension of the San Juan surface mine. At least 8 other leases were previously active small underground mines. However, these small mines have been closed for at least a decade. One underground mine plan to bring 5 leases into production is currently pending at the Department of the Interior. Mine plans affecting an additional 8 leases in 6 mines are in various stages of development. No significant development activity was found by OTA on 8 leases. In 1980, Federal leases in New Mexico produced over 6.3 million tons of coal out of a statewide total of 16.5 million tons.

Eight of the leases are owned by electric utilities, 6 by individuals, 6 by large cement producers, 5 by large energy companies, 2 by a small company with no coal mining experience, 1 by a joint venture of companies of diverse backgrounds, and 1 by an independent coal company.

Evaluation of Development Potential

As a first step in OTA's analysis of the development potential of the New Mexico coal leases, all leases held by the same lessee and which are contiguous or nearly contiguous were grouped into development "blocks" that approximate probable mining units. Sixteen lease blocks resulted; each block

contains from 1 to 5 leases. Three blocks are located in the Raton region and 13 are in the San Juan region. (See Table 1-1.)

OTA's evaluation of lease blocks approximates the process likely to be used by a prudent potential developer in identifying a favorable mining property. The analysis involves three steps:

1. "Screening" the lease tracts to determine whether the lease reserves meet minimum threshold characteristics required to develop a new coal mining property in New Mexico in the 1980's.
2. Identifying and analyzing other factors that might influence the tract's prospects for development. (This analysis was conducted during a 3 day "task force" meeting convened by OTA in Santa Fe in August 1980. The "task force" drew on the best professional judgment of the assembled experts from the New Mexico coal industry in assessing the development potential of each lease block.)
3. Synthesizing the data obtained during the initial screening, as well as information supplied by the task force and obtained by OTA from interviews, literature searches, and written correspondence, to make a final OTA evaluation of the development prospects of each lease block.

In addition to analyzing the development potential of individual leases, OTA undertook 3 further tasks in this study. OTA:

1. Estimated the potential productive capacity of the existing leases, based on information supplied by the task force and OTA contractors;
2. Identified the major issues and uncertainties which could affect the future of the New Mexico coal industry and discussed the relevance of each issue to the existing leases;

TABLE 1-1

FEDERAL COAL LEASES IN NEW MEXICO
September 30, 1980

Block	Lessee	Serial No.	Date Issued	County	Acreage	Type Of Lease[1]	Mine Plan Status[2]
DENVER RATON MESA BASIN							
1	Barney Urtado	SF-042800	4/8/24	Colfax	40.7	P	N
2	Robert Lee Davis	SF-074673	1/10/41	Colfax	40	P	N
3	Texas Industries, Inc.	SF-066817	1/25/35	Colfax	120	C	N
SAN JUAN BASIN							
4	Gulf Oil Co. (McKinley Mine)	NM-057349	4/1/61	McKinley	2513.46	P	A
		NM-057348	4/1/61	McKinley	2485.12		A
		NM-0554844	1/1/64	McKinley	540.49	P	A
		NM-065466	1/1/64	McKinley	2560	P	A
5	Thermal Energy Co. Peabody Coal Co. (Chaco Energy Co.) (Star Lake Mine)	NM-2457	9/1/67	McKinley	6336.12	C	S
6	James L. Simmons	SF-076644	5/10/44	Rio Arriba	80	P	N
7	Ametex	SF-048323	7/19/29	Sandoval	120	P	N
8	Ametex	NM-732	2/1/67	Sandoval	160	C	N
9	Florentino Padilla	SF-075301	12/11/39	Sandoval	120	C	N
		SF-077779	5/1/49	Sandoval	40	C	N
10	Ideal Basic Industries, Inc. (La Ventana Mine)	NM-0510466	7/1/67	Sandoval	2002.06	P	S
		NM-0510467	7/1/67	Sandoval	2432.94	P	S
		NM-0510468	7/1/67	Sandoval	2505.47	P	S
		NM-0555316	2/1/69	Sandoval	160	P	S
		NM-0555317	12/1/64	Sandoval	2206.04	C	S
11	Cimarron Coal Co. (La Plata Mine)	NM-0315559	8/1/63	San Juan	2044.15	C	N*
12	Eastern Assoc Properties Fannin Square Corp. (Black Lake Mine)	NM-10931	1/1/70	San Juan	1910.20	P	N*
13	Floyd E. Ingraham	SF-077115	7/27/44	San Juan	160	P	N
14	Western Coal Co. (Bisti Mine)	NM-0186612	8/1/61	San Juan	2188.62	C	S
		NM-0186613	8/1/61	San Juan	1240	C	S
		NM-0186615	8/1/61	San Juan	2027.16	C	S
15	Western Coal Co. (San Juan Mine)	NM-045197	11/1/61	San Juan	2565.60	P	A
		NM-045217	11/1/61	San Juan	1800	P	A
		NM-045196	11/1/61	San Juan	2467.24	P	A
	(San Juan Underground)	NM-28093	4/1/80	San Juan	3856	C	A**
16	Western Coal Co.	SF-071448	6/11/40	San Juan	40	P	A**

[1]Origin of Lease: (C) = Competitive Bid, (P) = Preference Right Lease Application

[2]Mine Plan Status: (A) = Approved, (S) = Submitted (includes inactive plans), (N) = No Plan
(A**) = Lease is included in San Juan Mine Extension, (N*) = Mine Plan filed after 9/30/80.

3. Grouped the existing leases into 4 categories for further analysis, ranging from detailed technical and economic analysis of active or near-active properties to more limited analysis of inactive properties with poor prospects for development.

OTA Initial Screening

OTA applied 5 screens to each lease block to test whether the leases meet certain minimum threshold requirements for a typical New Mexico surface or underground mine in the 1980's. The screens incorporate geographical, geological, reserves, coal quality, and ownership factors. The screens were reviewed and modified by the New Mexico task force. The revised screens are summarized in Table 1-2. The results of OTA's initial screening of New Mexico leases are shown in Table 1-3.

Only 7 of the 16 lease blocks, with a total of 19 leases, passed all OTA revised initial screens. Nine lease blocks, including 10 leases failed at least one screen. It is important to note that although a lease block may fail an initial screen, it could still be developed. The screens provide a profile of minimum requirements for a typical new mine of average size. Only Federal lease reserves are considered in this initial evaluation. State, fee or Indian lands controlled by the lessee are not included, nor are Federal preference right lease applications (PRLA's). The availability of additional reserves was, however, a factor used in later evaluations by the task force and OTA. Other circumstances that could lead to coal production from a block that failed initial screening would be development of a very small mine (less than 50,000 tons per year) for domestic uses, or mining as part of the expansion of an adjacent active mine. Indeed, only 4 of the 9 lease blocks failing the OTA screening tests maintained their unfavorable development

TABLE 1-2

OTA INITIAL SCREENING PROCESS FOR UNDEVELOPED FEDERAL LEASES IN NEW MEXICO

MINE TYPE	RECOVERABLE RESERVES	COAL QUALITY	GEOLOGY	CAPITAL INVESTMENT
Case 1 San Juan Basin Large surface or underground mine producing coal for electric utilities. Production: 1 million tons/yr. Mine life: 30 years	30 million tons	BTU/Lb. > 7500 Sulfur % < 1.5 % Ash % < 25%	Total Seam Thickness: Surface > 6' Underground > 6' Overburden: < 150' (strip) > 250' (deep) Seam Dip: < 8°	Surface Mine: $10-$15 million Underground Mine: $10-$15 million
Case 2 San Juan Basin Small surface or undeground mine producing coal for industrial use, spot markets, or special purposes. Production: 100,000 tons/yr. Mine life: 25 yrs.	2.5 million tons	BTU/Lb. > 7500 Sulfur % < 1.5% Ash % < 15%	Total Seam Thickness: Surface > 3' Underground > 5' Overburden: < 150' (strip) > 250' (deep) Seam Dip: < 15°	Surface Mine: $5-$10 million Underground Mine: $5-$10 million
Case 3 Raton Mesa Region Large undergound mine for industrial (metallurgical) purposes. Production: 1 million tons/yr. Mine life: 30 years	30 million tons	BTU/Lb. > 12,000 Sulfur % < 1.0% Ash % < 15%	Total Seam Thickness: > 3' Surface — Underground > 3' Overburden: > 250' Seam Dip: < 15°	Surface Mine: — Underground Mine: $20-$30 million

TABLE 1-3

SUMMARY OF LEASE BLOCK ANALYSES

Lease Block	Lessee	Does Block Pass OTA Screens?	Task Force Evaluation	OTA Final Evaluation	OTA Group Rating	1980 Production Status * (Capacity in 10^6 tons/year)	Task Force Estimate of 1985 Production Status *	Task Force Estimate of 1990 Production Status *
1	BARNEY URTADO	No	-	?	C	I	I	I
2	ROBERT DAVIS	No	-	-	D	I	I	I
3	TEXAS INDUSTRIES	No	-	?	C	I	I	I
4	GULF OIL CORP.	Yes	+	+	A	2.0	2.0	2.0
5	THERMAL ENERGY CO. & PEABODY COAL CO.	Yes	+	?	B	I	I	3.0
6	JAMES SIMMONS	No	-	-	D	I	I	I
7	AMETEX CORP.	No	-	-	D	I	I	I
8	AMETEX CORP.	No	?	?	C	I	neg.	neg.
9	FLORENTINO PADILLA	No	?	?	C	I	neg.	neg.
10	IDEAL BASIC INDUSTRIES, INC.	Yes	+	+	A	I	1.5	1.5
11	CIMARRON COAL CO.	Yes	+	+	A	I	2.0	2.0
12	EASTERN ASSOC. PROP. & FANNIN SQUARE CORP.	Yes	+	?	B	I	I	6.0
13	FLOYD INGRAHAM	No	-	-	D	I	I	I
14	WESTERN COAL CO.	Yes	?	?	B	I	0.5	5.0
15	WESTERN COAL CO.	Yes	+	+	A	4.0	4.0	4.0
16	WESTERN COAL CO.	No	+	+	A	I	neg	I

\+ = Favorable development prospects
? = Uncertain development prospects
\- = Unfavorable development prospects

* = Federal production only
I = inactive (no mining)
A,B,C,D, = See text.
neg. = negligible production

rating through subsequent task force and final OTA evaluations.

The majority of the blocks that failed the initial review did not meet the minimum requirements for reserves or ownership. Ten of the 29 New Mexico leases are smaller than 200 acres and do not appear to have sufficient reserves to offset the expense of equiping and operating a modern, efficient mine. Furthermore, 8 of these leased are owned by individuals or small companies which lack either the capital or technical expertise required to open a competitive mine--even if such an investment were prudent.

Task Force Evaluations

OTA convened a task force on August 25 to 28, 1980, in Santa Fe attended by coal experts familiar with coal development in New Mexico. The task force reviewed the results of the initial OTA screens and discussed other factors that could affect each lease block's development prospects. These factors include ownership of surface rights on adjacent lands, potential markets, transportation availability, local geological or engineering conditions, air quality, water availability, surface management, and socioeconomic impacts. The task force was asked to classify each lease block into one of three categories based on the likelihood of development within the next decade--favorable, uncertain, or unfavorable. The task force classifications are shown in Table 1-3.

The New Mexico task force participants rated 7 of the 16 lease blocks as having favorable development prospects, 6 as having unfavorable prospects, and 3 as having uncertain prospects. All the unfavorable blocks also failed OTA's initial screens--and were rejected by the task force for similar reasons. The task force rated favorably 6 of the 7 blocks passing all OTA initial

screens. One block that passed the initial screens with highly favorable reserve characteristics was rated as uncertain by the task force because of substantial unresolved surface resource conflicts. Because of active development plans, the task force gave favorable ratings to 1 block that failed the OTA screens. Two small blocks which failed the screens were rated uncertain by the task force: the participants agreed that these 2 tracts will not be developed unless they are mined as part of an adjacent block with a more extensive coal reserve base for which mine planning is well advanced.

Conclusions on Lease Development Prospects

After the task force, OTA reviewed the development prospects of each lease block and made a final rating for each using the same criteria--but not necessarily the same assumptions--as those applied by the task force. Five task force evaluations were altered by OTA in this final review. Because of additional information, 2 unfavorable task force ratings were elevated to uncertain and 3 task force favorable ratings were reclassified as uncertain because of unresolved market and transportation issues.

After OTA's reevaluation, 5 lease blocks were rated as favorable, 7 were rated as uncertain, and 4 were assessed to have unfavorable development prospects. (See Table 1-3.) The 4 unfavorable blocks contain less than 1 million tons of coal--less than 1 percent of the reserves under lease. The 5 favorable tracts contain over 285 million tons of recoverable reserves, or 64% of leased reserves. The 7 uncertain tracts contain over 162 million tons, or 36% of recoverable reserves under lease. The final evaluations may be summarized as follows:

1. Favorable prospects were given to: (a) 3 blocks that are included in

the mining plans for the 2 currently active mines (Blocks #4, 15, and 16); (b) one block included in projects with a mine plan pending at the Department of the Interior (Block #10); and (c) one block (Block #11) for which mine plan preparation was well advanced at the time of the task force.

2. An uncertain rating was assigned to the 2 Raton Mesa leases (#1 and 3), to 2 small lease blocks adjoining the site of a proposed mine northwest of Albuquerque (Blocks #8 and 9), and to 3 lease blocks in the Star Lake-Bisti region of central New Mexico where development is contingent on the completion of a proposed rail line into the area or the construction of major mine-mouth coal-use facilities (Blocks #5, 12, and 14). All of the 3 Star Lake-Bisti lease blocks were in advanced stages of mine plan preparation when the task force was held. Mine plans for all 3 have since been filed with federal and state reclamation agencies).
3. An unfavorable rating was given to 1 Raton Mesa lease (Block #2) and 3 small leases in the San Juan field (Blocks #6, 7 and 13). Three of the blocks are owned by individuals and 1 by a small company with no mining experience.

Classification for Further Analysis

This report completes only one part of OTA's evaluation of the development potential of existing Federal coal leases. Several lessees are being contacted for further information and ongoing contractor studies on technical and economic issues will be completed. OTA will then be in a position to estimate expected future production, rentals and royalties from existing Federal leases.

OTA has divided the New Mexico lease blocks into 4 groups for further research and analysis:

1. Group A--Active Mining Operations. Five lease blocks containing 15 of the 29 leases and more than half of the coal reserves under lease are in this category. The mine plans submitted by these lessees and estimated future production and revenues from these tracts were reviewed and summarized by OTA. The results of this review are reported in the working paper submitted to OTA by Dames and Moore, Analysis of Federal Coal Leases in Mine Plans in Colorado, New Mexico, and Utah, December 1980, available through the National Technical Information Service (NTIS), hereafter referred to as "Dames and Moore".

2. Group B--Star Lake-Bisti Area Mine Proposals. Three lease blocks including five leases and 23% of leased reserves are in this category. These properties contain large quantities of economically mineable coal and mine plan preparation and review is well advanced. Before planned full-scale production can begin, however, a railroad must be built in the isolated region and/or one or more large mine-mouth coal-fired electric generating stations or synfuels plants must be constructed. Furthermore, at least 1 lease has substantial surface resource conflicts that must be resolved. These blocks, the task force estimates, could contribute 14 million tons of the total expected Federal production of 22.5 million tons in 1990. The large potential role for these blocks justifies extensive further analysis. OTA will review the mine plans submitted by the lessees and estimate expected production and royalties (see Dames and Moore for results of this mine plan review). OTA will also follow ongoing

efforts to resolve the surface resource conflicts and transportation issues.

3. Group C--Small Properties with Uncertain Development Futures. Four small leases covering less than 1 percent of the coal reserves are included in this category. The inactive mines on each of these leases could be reopened under certain circumstances. The property could be combined with larger active or proposed mines on adjoining land or the lease could be developed as a very small mine for local markets. Negotiations have been reported for assignments of all 4 of the uncertain lease blocks to active mine developers. Should any such transfer occur before OTA prepares its final report on New Mexico leases, the development prospects of these leases will be reevaluated.

4. Group D--Unfavorable Lease Blocks. Four lease blocks covering less than 1 percent of the reserves under lease are in this category. All 4 blocks received unfavorable task force and OTA evaluations.

NOTE: In March 1981, after completion of OTA's mine plan analysis and revision of the draft New Mexico task force report, OTA upgraded the uncertain rating of the three lease blocks in Group B to favorable development potential for OTA's final report. Although full-scale commercial development of these blocks is still contingent on resolution of several uncertainties, these problems are no greater than those facing leases that were rated as favorable development prospects in other states. The Bisti lease exchange to avoid conflict with wilderness, archeological and paleontological resource values has not been completed. The two other blocks, Star Lake and Black Lake, still are dependent on completion of the Star Lake railroad, approval of preference right lease applications, and expanding markets for New Mexico coal if the

proposed mines associated with these leases are to reach full production. Mine plans have been submitted to state and federal reclamation agencies for all 3 blocks. In OTA's final report, these development uncertainties were reflected as ranges in potential production rather than in the blocks' overall rating. In revising the draft task force report, however, the original classifications have been maintained to reflect accurately the analysis used in reaching an evaluation of each block's development prospects.

Coal Production Potential

OTA asked the task force participants to estimate the expected production capacity for each lease block that the task force rated as favorable. The task force assumed that the Star Lake railroad would be completed by 1984; that coal development would not be demand-constrained; and that land use, environmental or socioeconomic impact problems would not prevent lease development. With these admittedly optimistic assumptions, the task force estimated that:

1. By 1985, 6 Federal lease blocks would be producing a combined total of 10 million tons of coal, a 4 million ton increase from the existing Federal mine production capacity of 6 million tons per year.
2. The task force estimated that 8 lease blocks could produce up to 22.5 million tons of coal by 1990.

The anticipated new production capacity on existing Federal leases is more than double the production capacity from currently producing Federal leases. The task force estimated that additional new coal production on fee, State, and Indian land, and from PRLA's and unleased Federal lands could boost total production in New Mexico to 72 million tons in 1990. (See Table 1-4.)

TABLE 1-4

OTA TASK FORCE ESTIMATES OF ANTICIPATED

NEW MEXICO COAL PRODUCTION IN 1985 and 1990

	1980	1985	1990
TOTAL PRODUCTION	16-19	30	72.3
INSTATE USE	11	14.8	17.8
EXPORT	7.3	15.2	54.5 *
END USE			
ELECTRIC UTILITY	17.2	26.5	68.5
INDUSTRIAL	1.1	3.5	3.5
SYNFUELS	-	-	-
SOURCE			
FEDERAL	6.0	10.0	34.5 **
INDIAN	8.0	9.0	20.0
STATE/FEE	4.3	11.0	17.8
	18.3	30.0	72.3

* Estimated that 20 million tons or more will go to Texas markets in 1990.
** Includes production from pending preference right lease applications.

The task force concluded that Federal lands will play an increasingly important role in the New Mexico coal industry between 1980 and 1990. In a review of coal production potential from all lands in New Mexico, the task force concluded--with the same set of assumptions as it used when considering Federal leases alone--that statewide coal production would nearly double from current levels to 30 million tons by 1985 and could nearly quadruple to 72.3 million tons by 1990. Production from mines with federal reserves would jump from its current level of one-third to nearly one-half the total State output in 1990.

Issues and Uncertainties

Federal leases with favorable or uncertain development prospects contain 447 million tons of good quality mineable coal. The large potential productive capacity from these existing leases was confirmed by the task force's evaluations. The actual rate and scale of coal production from New Mexico leases will be determined by the resolution of a wide range of issues and uncertainties which extend beyond the property characteristics of individual leases.

Actual production levels could vary from the OTA's projections. Several obstacles to coal mining could lower actual production below these projections, while the removal of some barriers to development and a strong coal market could cause production to increase above these levels.

A key determinant of actual coal production from New Mexico leases will be the level of out-of-State utility coal demand specifically and coal market considerations generally. Actual market demand will depend on a wide range of issues including the growth of electric consumption, coal supply decisions of

Texas utilities (Texas is the major potential new market for New Mexico coal), and the growth or decline in coal use relative to substitute fuels for power generation. Within New Mexico, the rate of commercialization of synfuels technology and the possible construction of additional powerplants to serve out-of-State customers are two additional factors bearing heavily on demand.

The lack of rail service to the central portion of the San Juan basin is the second most significant factor affecting the growth rate of New Mexico coal production. As explained above, the proposed Star Lake Railroad is in an advanced planning stage, but a right-of-way acquisition problem could still delay or prevent its construction.

Other major issues and uncertainties that will affect the future of the New Mexico coal industry include environmental impacts on local communities, and the amount of additional Federal reserves made available for mining through PRLAs and new lease sales. Mining and associated industrial development such as synfuels plants pose potentially unacceptable and unfavorable air quality impacts in this arid region. Mining in the Bisti area conflicts with protection of 3 important archeological and paleontological sites. An exchange of existing leases for new federal coal to avoid some of these conflicts is under consideration. Demand for adequate water supplies for mining, reclamation, synfuels development, and community needs and the need to protect water supplies from possible degradation could creat conflicts between coal development and other users.

Because of the arid climate, sparse vegetation, and high susceptibility to wind and water erosion, reclamation of surface-mined lands in the San Juan basis may prove more difficult than in other areas of the West. This difficulty is not, however, expected to restrict mine development.

Most of the expanded coal development on federal leases in New Mexico will occur in areas that are relatively isolated and sparsely populated. Associated population increases and demands for community services will impose additional administrative and financial requirements on the existing communities. Moreover, because Native Americans own or occupy substantial acreages throughout the basin, resolution of potential conflicts between mining and Native interests will require cooperation with tribal governments and the U.S. Bureau of Indian Affairs.

There are currently twice as many acres under PRLAs than under existing leases in New Mexico. Processing of PRLAs in New Mexico will have a significant effect on the future of federal coal development there. Two proposed federal mines could be adversely affected by loss of reserves if adjoining PRLAs are rejected. New leased reserves from other PRLAs will compete in the market with other federal and non-federal coal currently available for mining.

CHAPTER II. ISSUES AND UNCERTAINTIES AFFECTING FEDERAL COAL DEVELOPMENT IN NEW MEXICO

The potential productive capacity from existing Federal leases in New Mexico is substantial. OTA's analysis of existing Federal leases identified more than 447 million tons of good quality mineable coal in lease blocks with favorable and uncertain development prospects. The OTA task force estimated that total New Mexico coal production could increase from 1979 levels of 14.6 million tons to 30 million tons by 1985 and to more than 72 million tons by 1990. The rate and scale of future New Mexico coal production, however, will be determined by the resolution of a wide range of external issues and uncertainties. Several major considerations affecting New Mexico coal development in the next decade have been identified by OTA. These include the future market for New Mexico coal and competing sources of energy, railroad construction, and resolution of issues affecting Indian surface rights, environmental protection, socioeconomic impacts of energy development, processing of federal preference right lease applications, and enforcement of federal diligent development regulations.

The Market for New Mexico Coal

New Mexico produced 14.6 million tons of coal in 1979, according to the New Mexico Energy and Minerals Department. This production came from the following sources:

1. Utah International Inc.'s Navajo Mine--a large mine on Indian land previously serving New Mexico power plants.
2. Western Coal Company's San Juan Mine operated by Utah International, Inc.--a large mine on Federal land serving New Mexico power plants.

3. Pittsburgh and Midway's McKinley Mine--a large mine on Indian, Federal, and fee land primarily serving Arizona utilities.
4. Kaiser Steel Corporation's York Canyon Mine--a 1.5 million ton per year mine on non-federal land serving out-of-state industrial and utility markets.
5. Two small mines on non-federal lands serving out-of-state industrial and utility markets (Am Coal and Carbon Coal Co.).

ASSUMPTIONS

OTA asked task force participants to estimate the potential size and composition of the New Mexico coal market in 1985 and 1990. Based on their best professional judgment and a set of optimistic, but reasonable, assumptions, the task force established the following assumptions as guidelines for its informal market projection:

1. The Star Lake-Bisti railroad will be completed by mid-decade.
2. A major market for New Mexico steam coal (about 20 million tons per year) will develop in Texas and the Gulf Coast.
3. New Mexico will maintain its current share of other out-of-state coal markets.
4. Pending preference right lease applications will be issued by the Department of the Interior, but no coal will be produced from new mines on other unleased Federal land by 1991.
5. Conflicts between strip mining and surface resource values--such as potential wilderness areas, unexcavated archeological and paleontological sites, or Indian surface rights--will not reduce the overall level of future coal production, although such conflicts

could delay or displace some proposed mines.

6. The demand for electricity in New Mexico and the western region will continue to grow at an annual rate of 4 percent.
7. No commercial scale synthetic fuels plant using New Mexico coal will be in operation by 1990.

While these assumptions could be viewed as optimistic, it is important to note that the task force limited its assessment of potential productive capacity to those coal reserves already leased or owned by active coal mining companies which have prepared preliminary or advanced plans to initiate production before 1990. The task force projections include no output from currently unleased Federal land, from coal owned by companies without mining capabilities, or from reserves which cannot be mined with existing technology. The task force projections are conservative to the extent that they include only projects for which serious development activities are underway.

Task Force Production Estimates

The task force estimates are summarized in Table 2-1. Total statewide production could nearly double to 30 million tons per year by 1985, and nearly quadruple to over 72 million tons in 1990. The task force predicted that the largest growth in coal production will occur on Federal land. Output from existing leases and preference right lease applications was estimated to increase more than five times, from 6 million tons in 1980 to 34.5 million tons in 1990. This production would come from 9 mines located entirely or partly on Federal land: production capacities of these mines range from 1.5 to 6 million tons per year. Output from fee land was estimated to increase

TABLE 2-1

OTA TASK FORCE ESTIMATES OF ANTICIPATED

NEW MEXICO COAL PRODUCTION IN 1985 and 1990

	1980	1985	1990
TOTAL PRODUCTION	16-19	30	72.3
INSTATE USE	11	14.8	17.8
EXPORT	7.3	15.2	54.5 *
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STATE/FEE	4.3	11.0	17.8
	18.3	30.0	72.3

* Estimated that 20 million tons or more will go to Texas markets in 1990.
** Includes production from pending preference right lease applications.

fairly steeply, from 4.3 million tons in 1980 to 11 million tons in 1985, and then to level off to reach 17 million tons from 10 mines in 1990. Individual mine outputs from fee land would range from 100,000 tons per year to 3 million tons per year. Finally, coal production from Indian land currently under lease was estimated by the task force to increase from 8 million tons in 1980 to 20 million tons in 1990. The 3 mines on Indian land would have 1990 capacities of 1, 7, and 12 million tons per year.

The task force predicted a large growth in out-of-state demand for New Mexico coal and a dramatic increase in coal consumption by western utilities. While in-state coal use was predicted to rise from 11 million tons in 1980 to 17.8 million tons in 1990, participants estimated that coal exports could soar from 7.3 to 54.5 million tons. Nearly all of the increased coal production is destined for the utility steam market, which was projected to jump from a 1980 level of 17.2 million tons to 68.8 million tons by 1990. Limited growth is predicted in the industrial market--from the current level of 1.1 million tons to 3.5 million tons in 1985-1990. The task force assumed that no commercial-scale synfuels plant using New Mexico coal would be on-line by 1990. (While the task force acknowledged that one lessee, Eastern Associates, had announced plans to join with Texas Eastern in a synfuels project, initial production from the lessee's Black Lake Mine would be sold as steam coal, because the proposed synfuels plant would probably not be operational until the 1990's.) The task force did not envision the emergence of any substantial foreign export markets for New Mexico coal in the next decade (i.e., more than 2-3 million tons at most).

The task force estimates of future coal production capacity in New Mexico greatly exceed some other recent coal supply and demand forecasts. For

example, the February 1981 update of the Department of Energy's (DOE's) Western Coal Development Monitoring System reports that 60.5 million tons of coal could be mined in New Mexico in 1990, based on a survey of mine capacity of local coal operators. In contrast, DOE's Preliminary National and Regional Coal Production Goals for 1985, 1990 and 1995 sets a mid-range goal of 34.2 million tons of New Mexico coal in 1985 and a mid-range goal of 56.6 million tons in 1990. These production goals represent an increase from previous DOE targets, but nevertheless fall below the 1990 production potential envisioned by the task force. DOE's final projections contained in The 1980 Biennial Update of National and Regional Coal Production Goals for 1985, 1990, and 1995 issued in March 1981 raised the mid range 1985 goal to 38 million tons and the mid range goal to 64 million tons. DOE's New Mexico goals, however, represent the largest percentage boost in coal output anticipated for any of the 12 coal supply regions included in its analysis. (Copies of these projections are reproduced in the Appendix.)

New Mexico's large surface mines could provide strong competition for Wyoming coal in some markets. A market study prepared for OTA by Energy and Environmental Analysis, Inc., projected that New Mexico production could reach 40 million tons by 1985 and 60 million tons by 1990. EEA concluded that the price competitiveness of New Mexico coal in major eastern and western markets was considerably underestimated. (Energy and Environmental Analysis, Inc., "Feasibility of Using Coal Market Projections to Appraise Potential Production of Federal Leaseholds", draft report, May 1980.)

The rapid expansion of New Mexico coal production is dependent on the emergence of a strong out-of-state utility market and the resolution of key uncertainties--such as construction of the Star Lake Railroad. OTA has

identified the following uncertainties that will shape the potential market for New Mexico coal in the 1980's and 1990's.

1. Out-of-state utility markets. Will there be a major boom in coal use by Texas utilities, and will New Mexico garner a major share of the fuel supply contracts? Will markets expand in Arizona and new markets open in California? Will electrical demand continue to increase at 4% per year?
2. In-state utility markets. Will the "New Mexico Generating Station," a 2,000-megawatt coal-burning power plant proposed by Public Service Company of New Mexico go on line within the next decade?
3. Synfuels. Two major synfuel complexes have been proposed for New Mexico within the past decade. One project on Navajo land was abandoned. A current federal lessee has recently received a $3 million DOE grant to study the feasibility of what could be a third project. The recent passage of the Energy Security Act could provide additional economic incentives to build one or all of these projects. Will there be a synfuels market for New Mexico coal by 1990?
4. "Coal by Wire". New Mexico has traditionally exported more than half the electricity produce in the state to out-of-state customers. Recent state policies have leaned away from such in-state use toward coal shipments to power plants located in electricity consuming states. How likely is a possible shift in state policy to increase in-state coal demand?
5. Industrial markets. A small, but growing, amount of New Mexico coal is provided to industrial customers--mainly cement producers--within

and outside of New Mexico. What is the likelihood of a major increase in direct use of coal by industries?

6. Domestic use. The coal regions of New Mexico are dotted with abandoned mines which previously provided coal for domestic use. The domestic market for coal has all but disappeared, however. What is the likelihood of increased domestic use of coal in New Mexico during the 1980's?

7. Foreign exports. Although foreign exports of coal are increasing nationwide, western states have not yet shared in this new market. Some New Mexico coal has been shipped to Japan, but the emergence of an export market depends on several factors--including the price of competing coals and the establishment of port facilities suited for large coal shipments. What factors would make New Mexico coal competitive in the world market within the next decade? Would increases in U.S. foreign coal exports expand domestic markets for New Mexico coal?

Competing Sources of Energy

Coal developers holding currently undeveloped Federal coal leases must compete with other sources for a share of the future energy market. These other sources include the following:

1. Coal supplies from Indian land. The Department of the Interior estimates potential coal production on Navajo lands of 133 million tons per year. Only a fraction of this level is likely to be attained, but Navajo coal development could easily surpass current production of 7 million tons per year. Coal development is also

under consideration on lands held by other Tribes.

2. Federal Preference Right Lease Applications. The Department of the Interior estimates that there are more than 1.5 billion tons of recoverable coal reserves under the 28 pending PRLA's. DOI projects that these reserves could sustain mines producing up to 30 million tons per year.

3. Production from currently operating leases or leases in pending mining plans could increase above projected levels and corner a larger share of the market relative to undeveloped leases.

4. State and fee coal. DOI estimates that 32 million tons of coal from the San Juan region and 106 million tons from the Raton basin could be produced annually from state and private lands.

5. Out-of-state coal. Although New Mexico is currently a net exporter of energy, coal imports--particularly from the Colorado portion of the Denver-Raton coal fields--could compete to supply in-state markets. Out-of-state coal obviously competes with New Mexico coal in all export markets.

6. Other conventional fuels. Other fuels, such as natural gas, oil, and uranium, compete for a share of the electric utilities fuel market. Shifts in installed generation technology could affect coal production from New Mexico leases.

7. Nonconventional energy resources. Major growth in the commercialization of alternative energy technologies--especially solar and geothermal power--could affect New Mexico's future coal market.

8. Energy conservation. A decrease in the historical rate of growth in energy demand through conservation could reduce the need for New Mexico coal.

Transportation

The section of the Fruitland coal formation of west-central New Mexico stretching approximately from Bisti on the west to Star Lake on the east is one of the largest untapped strippable coal deposits in the western United States. Five large undeveloped leases lie along the narrow strip defining the best quality coal, as do nearly all of the 28 outstanding preference right lease applications. See Figure 2-1. This remote and rugged desert region is currently isolated by the lack of rail transportation--or even a major roadway.

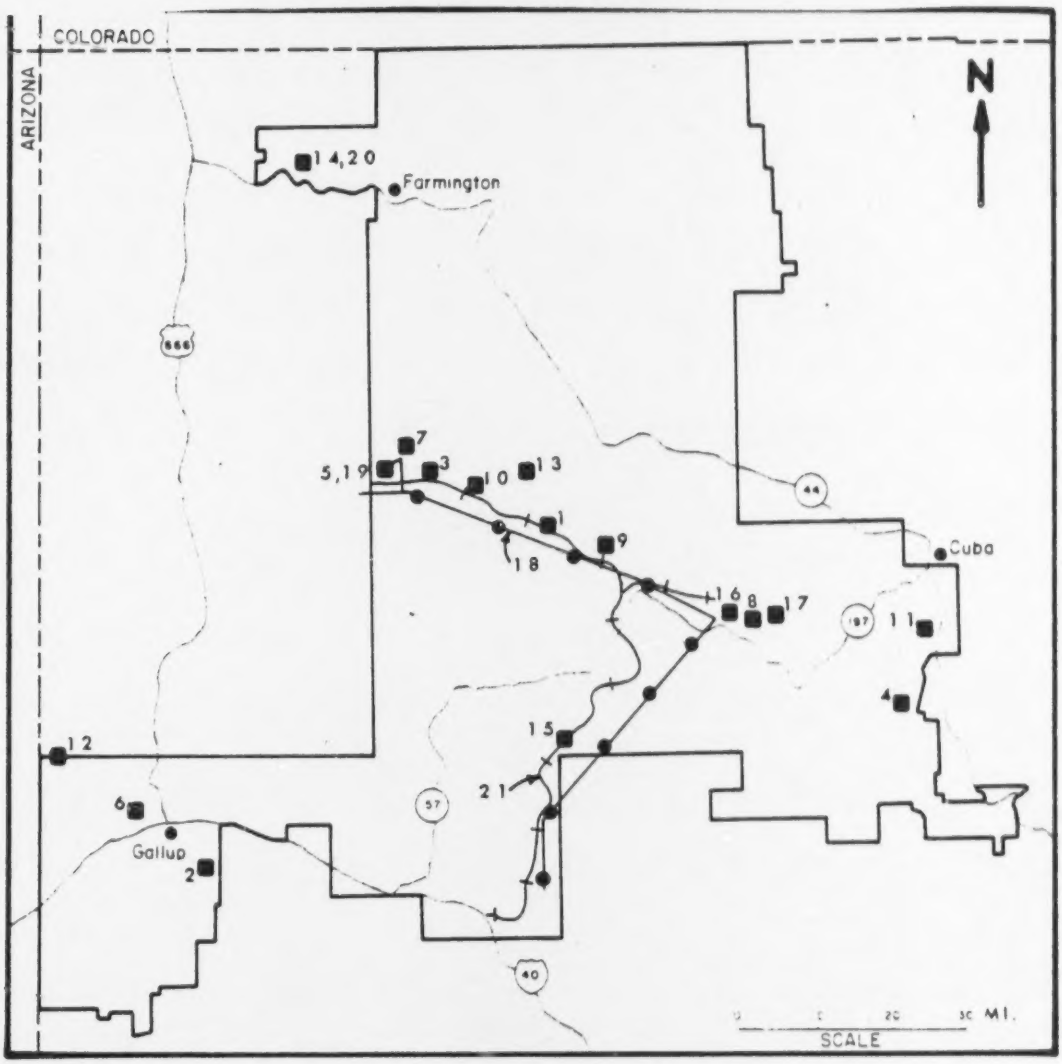
The development of the 5 existing leases in 3 lease blocks in this region could be contingent on the completion of the proposed Star Lake Railroad. The Department of the Interior reports in its final environmental impact statement for the project that the 114 mile rail line, if completed, could carry 16.5 million tons of planned coal production from the Fruitland formation by 1990. Full development, facilitated by the railroad, could lead to an annual output of 75 million tons per year from 17 mines along the rail route. The New Mexico task force estimated that 8 million tons of coal output in 1990 from existing federal leases, plus an additional 18 million tons from four mines on land covered by preference right lease applications, is contingent on the construction of the railroad.

The final environmental impact statement on the rail project has been issued. The Bureau of Land Management has approved rights-of-way across public lands, however, construction has been delayed by the decision of the Secretary of Interior until the issues surrounding rights-of-way over about 25 miles of tribal trust and Indian allotment lands have been settled. The remaining uncertainty involves obtaining consent from the tribe for right-of-

FIGURE 2-1

EXISTING AND PROPOSED COAL-RELATED DEVELOPMENT

IN THE STAR LAKE - BISTI REGION



Legend:

Coal Mines

1. Alamito
2. Amcoal
3. Arch Mineral
4. Arroyo #1
5. Bisti
6. Gamerco
7. Eastern
8. Salazar
9. Gallo Wash
10. Gallo Wash Pits 3 &4
11. La Ventana
12. McKinley
13. Blanco Nageezi
14. San Juan
15. South Hospah
16. Star Lake
17. Star Lake East

Related Development

18. Fruitland Coal Load
19. New Mexico Generating Station
20. San Juan Generating Station
21. Star Lake Railroad

way over approximately 3 miles of land held in trust by the United States Government for the benefit of the tribe. The tribe has agreed in principle to consent to right-of-way over the tribal trust lands but is continuing to negotiate with the Santa Fe Railroad for additional terms to be included in the easement. The railroad asked Secretary of the Interior Andrus to waive the tribal consent requirement if final terms to be included in the easement cannot be agreed upon within a reasonable time. Tribal trust lands cannot be condemned for the right-of-way and rugged terrain makes the cost of rerouting across other lands prohibitive.

Negotiations with the Indian allottees for land exchanges and/or cash or other remuneration is continuing, but is complicated by the issue of validity of certain allottee consents. According to the Bureau of Indian Affairs in Washington, D. C., 54 Indian allottees have appealed the Commissioner of Indian Affairs' decision to disapproval of the right-of-way. The appeal asserts that B.I.A. Area Director should have gone further in his decision and disallowed the right-of-way unconditionally, instead of remanding the matter to the Area Director for further fact finding. Of the 54 Indian allottees on whose behalf the appeal was filed, only 30 are actually affected by the Star Lake Railroad. The B.I.A. has moved that the appeal be dismissed and that the Area Director reconsider whether the allottees' consents to the right-of-way were validly obtained. The Star Lake Railroad has also moved that the appeal be dismissed and that the Area Director review the facts surrounding obtaining of allottee consents and make a final decision as to validity. Individual allottees' lands may be condemned, however, any such eminent domain proceedings must be filed in federal court because the federal government is entrusted with responsibilities for Indian allotment lands.

Despite these obstacles to the railroad currently posed by the right-of-way issue, the task force members were unanimous in their belief that the right-of-way problems would be favorably resolved in the near future and that construction of the railroad could begin shortly thereafter. The Star Lake Railroad Company has stated that it can complete all work to connect the Bisti line with the Santa Fe main line at Prewitt, New Mexico, within approximately two years.

Another major rail construction project could influence the development potential of existing New Mexico leases as well, although no federal coal will be carried over this line. El Paso Natural Gas Company and Consolidation Coal Company--joint owners of a large Navajo land coal lease--have proposed a 115 mile rail line through reservation land to connect their leases with the east-west trunk line at Gallup. If this rail line is completed, it could carry between 4 and 25 million tons of coal per year. Since this coal would compete with coal produced from federal leases in the state, the construction of the railroad could affect the costs, scale, and location of federal land development. Plans for the proposed "Con Paso" rail line are tentative.

A third transportation issue concerns not the transportation of coal itself, but the transmission of electricity generated at coal-burning facilities. The most isolated lease block near Bisti has been proposed as a fuel source for a 2,000 megawatt coal-burning power station, the New Mexico Generating Station. The Public Service Company of New Mexico has proposed a 230-kilovolt transmission line to connect the proposed generating station with the existing electrical grid 209 miles to the southeast. A construction schedule for the power plant and transmission line has not been established.

Finally, access to at least seven lease blocks in other parts of New Mexico--all small, single-lease units--is difficult because of rugged, mountain terrain or distance from adequate transportation and markets. All seven blocks are several miles from existing major highways and are served only by unpaved and easily eroded dirt roads. These access routes will have to be upgraded before these blocks could produce at significant levels. The total potential production of these isolated leases is minimal.

Indian Surface Rights

Much of the land in the San Juan basin is owned, leased, or occupied by Indians. Land status in this are is extremely complicated because of the extensive intermingling of public fee, states, and Indian-owned land, split ownership patterns between mineral and surface rights, and the several categories of Indian land ownership. These complex problems can affect the development of existing leases in several ways.

Several New Mexico Federal lease tracts include Federal mineral rights under Indian lands that lie outside reservation boundaries. These Indian lands include tribal fee lands, tribal trust lands, and individual allotment lands. Indian surface rights present additional considerations to development because of the Department of the Interior's special trust responsibilities for Indian lands and possible Tribal jurisdiction over surface use. For this reason, some potential coal developers are negotiating with Indian surface owners to sell or exchange surface rights for rights to non-coal lands elsewhere.

Indian "allottees"control 25 miles of the proposed right-of-way for the Star Lake-Bisti railroad; 3 miles of the proposed right-of-way crosses tribal trust lands. The outcome of land exchange and payment negotiations currently

underway will determine the fate of the railroad and the development prospects of two lease blocks: Star Lake and Black Lake.

At least 100 allottee dwellings are located on land covering strippable coal reserves in the San Juan basin. Portions of two existing leases (Star Lake and Black Lake) are occupied by allottees who own rights to the surface above the coal. In both cases, complicated land exchange negotiations are underway to transfer grazing permits and tribal fee land. In particular, the problem of exchanging tribal (non-taxable) land above coal reserves for fee (taxable) land offered by coal companies must be resolved. Most Indians would prefer to exchange tribal lands for fee lands that would be given nontaxable tribal land status, but Congressional action might be required before such arrangements could be included in the exchange package. All exchanges must be approved by the Bureau of Indian Affairs.

The occupation of public land by what the Bureau of Land Management calls "unauthorized inhabitants" poses an additional potential conflict. Over the last several decades, about 40 Navajo families have settled on public land for which they hold grazing permits but not surface occupancy rights. Four such families are living on land covered by one existing lease block. Other families are living on lands covered by preference right lease applications. While the Bureau of Land Management maintains that such occupation is illegal and that the Indians can be forced to move without compensation, they recognize that the legal rights of these Indians are cloudy. Some of these "occupants " might be able to claim aboriginal title to the lands they and their families have lived on for generations. In any event, forced evictions are viewed by the BLM as politically unacceptable. Negotiations are underway to move these Indians onto tribal land nearby. The Bureau of Indian Affairs has offered to build homes in the new areas as part of the exchange. The coal

lessees have also been active participants in developing strategies that would provide all the surface occupants--both allotment holders and "unauthorized occupants" with alternative lands.

The logical mining units for coal reserves included in existing leases often involve tribal, state, and fee land sections in addition to the federal reserves. Though this sort of "checkerboarding" is common in the San Juan basin, task force members believed that from the lessees' perspective, all problems of organizing existing leases into logical mining units with nonfederal tracts have been resolved. Only surface use problems associated with the allottees and "unauthorized inhabitants" remain unresolved.

Wilderness Study Areas

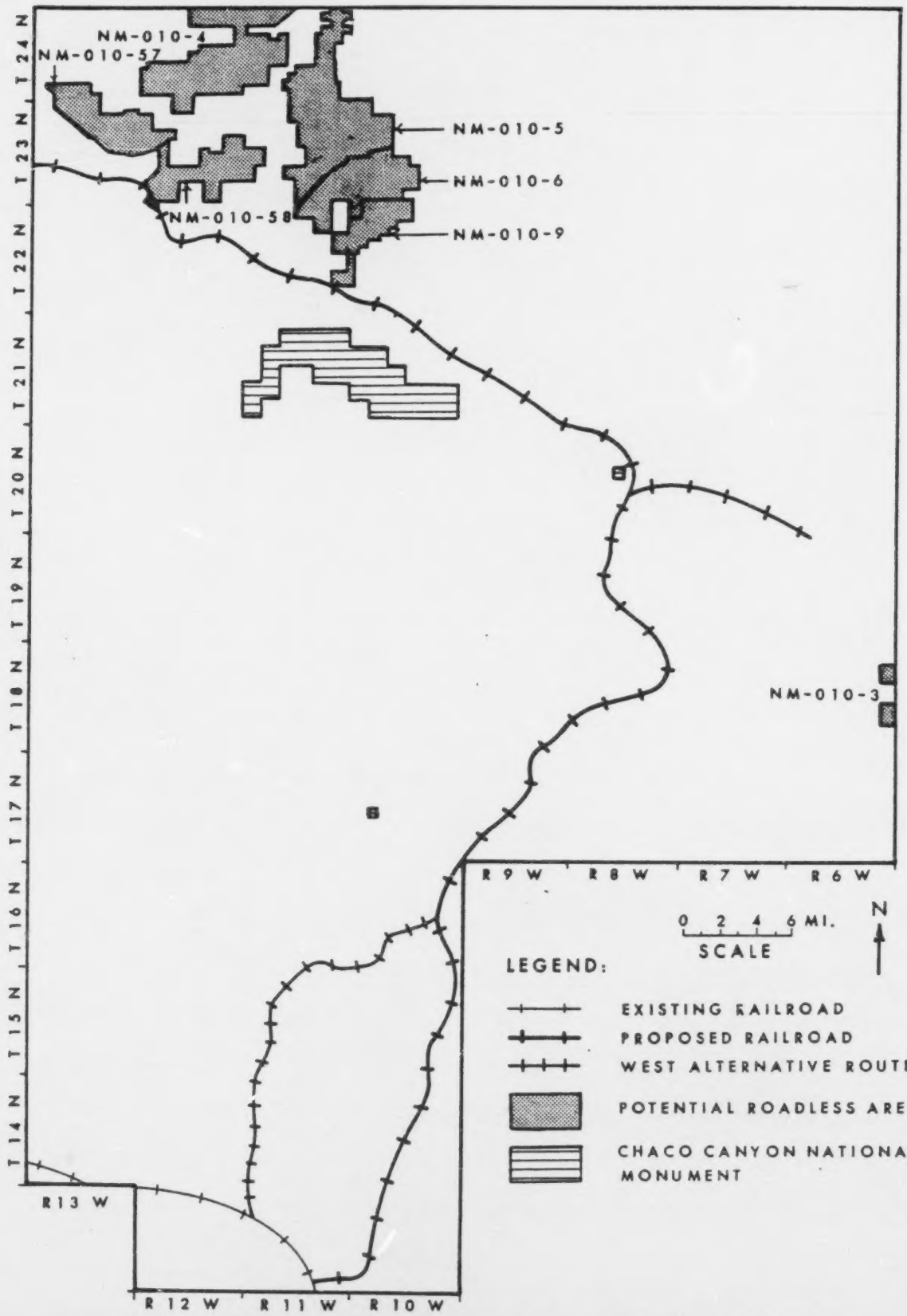
Three areas in the Star Lake-Bisti EIS Region were identified as areas that might conflict with potential coal development during the accelerated wilderness inventory. (See Figure 2-2.) Three Wilderness Study areas were identified:

Bisti	NM-010-057	3,520 acres
Denazin	NM-010-004	19,000 acres
Al-she-sle-pah	NM-010-009	6,000 acres

Section 603 of the Federal Land Management and Policy Act requires that during the period of wilderness review, the lands must be managed so as not to impair their suitability for wilderness designation by Congress.

The Bisti wilderness study area overlaps 1,360 acres on two of three Western Coal Company leases. Though mining could occur on the third lease and the portions of the other two leases not included in the wilderness study, the task force asserted that full development of the tract would not occur unless

FIGURE 2-2



INVENTORIED ROADLESS AREAS ALONG THE PROPOSED STAR LAKE RAILROAD.

a land exchange could be arranged to provide additional reserves. Western Coal Company and the Department of the Interior are negotiating a potential exchange of the wilderness study land for unleased acreage adjoining those portions of the leases not overlain by wilderness study areas. Special authority to allow such an exchange of these two leases for adjacent unleased federal coal lands was approved by Congress in Public Law 94-475 (90 Stat. 2269, Oct. 19, 1980. See Senate Report 96-800 accompanying S.1455, June 19, 1980). Western Coal Company has agreed to defer for two years any development plans on the tracts to give Interior an opportunity to collect additional information for the possible lease exchanges. By law, the exchange is to be completed by April 1983 or as expeditiously as possible. The outcome of these actions will affect the development potential of this lease block, which could support a 5 million ton per year mine by 1990, according to task force estimates.

Preference Right Lease Applications

There are 28 preference right lease applications currently pending before the Department of the Interior for federal coal land in New Mexico. Most of the applications cover lands in the Star Lake-Bisti region. New Mexico PRLA's contain more than 77,000 acres of public land and more than 1.5 billion tons of recoverable coal reserves. If these applictions are converted into leases, several new potential competitors will enter the New Mexico coal industry and affect the ability of current lessees to compete for future markets. The Department of the Interior will begin processing the Ark Land PRLA's in 1982 and will complete processing all PRLA's before the end of 1984. (Ark Land has requested and received expedited review of its PRLA's.)

Although the disposition of the PRLA's is important to future New Mexico coal production, only two lease blocks are directly affected (No. 11, held by Eastern Associates and Fannin Square, Inc., and No. 5, held by Chaco Energy, Thermal Energy Corp. and Peabody Coal Co.). The lessees of these blocks hold preference right lease applications for acreage near their leases. Each lease block can sustain a mining operation based on federal leases on federal, state and fee reserves, but long-term development at the estimated capacity of 12,000,000 tons per year depends on the issuance of the associated PRLA's. (A list of pending preference right lease applications is included in the Appendix.)

Diligent Production Requirements

The Department of the Interior's program to implement the diligent development provisions of the Mineral Leasing Act of 1920 affects lessees of currently inactive leases. Regulations promulgated in May 1976 under this provision call for certain minimum levels of production on all logical mining units containing existing leases by June 1, 1986, although extensions could push the deadline into the 1990s. The task force estimates that six of the 16 New Mexico lease blocks will be in production by 1985, and so will meet the diligence requirements, and that another three will be producing by 1990. These last three would have to qualify for an extension of the diligence date under existing guidelines. The regulations provide that extensions may be granted, among other contingencies, for strictly internal Departmental delays, for additional time required to develop advanced technologies such as coal gasification or liquefaction, for the additional planning requirements of large-scale projects (such as surface mines producing more than 5 million tons per year after achieving diligence), or for production to meet the commitments of firm contracts for delivery after the 1986 diligence date. It is probable

that the three lease blocks could qualify for an extension under one or more of the suggested conditions.

Leases in the seven blocks for which the task force believes production is unlikely before 1990 could be subject to cancellation for failure to meet diligence requirements. Some industry sources have asserted that this possibility could force some of these generally unfavorable tracts into production as part of a lease-maintenance strategy, even if lessees mined only the minimum quantities required to comply with the diligence regulations.

Reclamation Issues

Both active coal mines on federal leases in New Mexico, the San Juan and McKinley mines, are surface mining operations. Of the seven new mines that the task force expects to come into production by 1990, six will be strip mines. All these mines are located in arid, ecologically fragile regions where land reclamation is difficult, at best and, as some studies suggest, might be impossible. Concerns about reclamation potential are most severe for mines proposed for the Star Lake-Bisti region. An analysis prepared for OTA on the revegetation potential of coal lands in the San Juan Basin states:

"Much of the surface mineable coal in the San Juan Basin of New Mexico lies beneath desert areas where annual rainfall may be as low as 7 inches. The desert areas are located in the lower bottoms of major drainage areas and frequently display saline and alkali soil conditions that are difficult to revegetate following coal excavation. Even when the best known planting methods are used, it may require several years of natural plant succession after initital plantings before a comparable cover of diverse plant species will occupy the area.

It is generally recognized that these desert areas can be reclaimed only by establishing parent plant material through supplementary irrigation, to be followed by natural plant succession over a period of perhaps 10 to as many as 40 years.

Many potential surface mines in the San Juan Basin will not only include

the desert lowlands, but will include some adjacent foothills as well. These areas receive from 10 to 24 inches of annual precipitation and can be rather readily rehabilitated even without supplementary irrigation.

Some of the lowland and foothill areas that overlie surface mineable coal have local sandy soil conditions that are susceptible bo both wind and water erosion unless adequate vegetation cover is present. These areas require careful reclamation planning to avoid creating dune areas. Another potential site specific problem is sodic soil conditions in the bottom land areas where saline and alkali conditions are often excessive. These areas have been reclaimed rather successfully if topsoils from adjacent foothill areas are used for a plant growth medium.

It is vital to recognize these rather difficult situations in strip mining for recovering coal of the San Juan Basin of New Mexico in order to avoid total disaster in the reclamation procedure of the overall mining plan."

Task force members--citing reclamation experiences at operating mines, reclamation studies underway, and conversations with potential coal developers, stated their belief that new coal mines in New Mexico could comply with all provisions of the federal strip mining law and that successful reclamation, while difficult, could be achieved.

On the other hand, several reclamation studies, including The National Academy of Sciences' Rehabilitation Potential of Western Coal Lands (1974) and the recently released Reclaiming the West (INFORM, Inc., New York, 1980), have identified environmental problems created by mining in New Mexico which have yet to be successfully corrected through reclamation practices. Many of the sites investigated, however, were disturbed before the passage of the Surface Mining Control and Reclamation Act, which established minimum federal standards for mined land rehabilitation.

According to task force members from industry and state government, the central issue for coal developers is difficulty in obtaining necessary government permits, rather than the actual reclamation potential of the leased area. Mine permit approval requires that the operator demonstrate that the

disturbed lands can be reclaimed. Given the problems with reclamation efforts at some sites and lack of past surface coal mining in some areas, some question whether successful, long-term rehabilitation of coal mined lands in the arid conditions of the southwest can be demonstrated. However, state and federal reclamation officials have approved mine plans in these areas, it is clear that they have adopted an optimistic position on this issue and that reclamability has not prevented mine development.

The confusion and delay associated with implementation of federal and state programs under SMCRA was of great concern to state and industry participants. New Mexico initially submitted a program to the U.S. Office of Surface Mining in February, 1980 to gain authority to enforce reclamation regulations within the state. This interim program was approved in August, 1981 thereby eliminating at least some of the confusion. However, considerable confusion remains, particularly concerning the applicability of certain standards in the permanent federal program regulations that were remanded to DOI for rewriting as a result of lawsuits brought by the mining industry. Until new and acceptable federal regulations are promulgated, state officials and mining companies will be unsure of requirements to be imposed under the state program. This uncertainty is likely to continue as New Mexico moves toward developing a permanent strip mine regulatory program and implementing a cooperative agreement authorizing the state to enforce reclamation laws on federal lands.

Small Underground Mines

At least seven of the 29 outstanding federal coal leases previously supported underground mining operations. These mines were closed in the 1950s and 1960s due to structural and fire hazards, an inability to comply with

health and safety regulations, and the decline of a domestic coal market in New Mexico.

These currently inactive leases still contain sufficient coal reserves to support a small operation. The task force characterized the prospects for a re-emergence of small mining as poor--citing the lack of markets, the difficulty of obtaining the necessary government permits, and the cost of developing a mine plan and complying with health and safety precautions. However, at least one government program exists to provide assistance to a small mining operation--the Small Operator's Assistance Program of the Office of Surface Mining. Although the program has not been widely used, one small mine on non-federal land in New Mexico has sought and received assistance for conducting necessary technical studies for mine plan preparation.

One lease block, covering five leases, is currently proposed for a 1.5 million ton per year underground mine. Though the same issues of cost, safety, and markets apply to this tract as to the smaller leases, a mine plan, considered to be a "model" by the task force, has been submitted to the Department of the Interior. The lease block is owned by a large company capable of bearing the safety costs, and a firm captive market exists for at least a portion of the coal to be mined from this land.

Surface Resource Conflicts

The coal reserves of the Fruitland formation--especially near Bisti--lie under land endowed with many potentially significant geological, paleontological, and archeological sites. Some of this land--including the Bisti wilderness study area and the entire Chaco Canyon National Monument--are protected, at least temporarily, from energy development. These resources include unexcavated Indian ruins, so called "outlier" communities of the Chaco

culture, paleontological sites and the scenic and unusual wind-eroded badland features of the Bisti area. These resource values pose almost irreconcilable conflicts with energy development. Irreplaceable archeological, paleontological, and geological assets are known to exist in great concentration on at least one lease block, and could exist on several others and on some PRLAs. The enlargement of the Chaco Canyon National Monument and the proposed Bisti lease exchange could eliminate at least part of the conflict by foreclosing mining in the area involved.

Government and lessee studies are currently being conducted to identify sites before mining begins and to develop programs to insure either their preservation or their responsible disposition. The state is moving toward a "mitigation" policy permitting mining and the removal of archeological and paleontological artifacts in all but the most unusual circumstances.

Air Quality

The task force strongly stated that full development of existing federal coal leases could occur without violating any federal or state air pollution standards. Participants identified the only major problem as possible difficulties in obtaining necessary "prevention of significant deterioration" permits issued under provisions of the Clean Air Act of 1977. Chaco Canyon National Monument is currently a Class II clean air area. In September, 1979, a departmental task force identified Chaco Canyon as a candidate for secretarial recommendation for redesignation as a Class I clean air area under Section 164(d) of the Clean Air Act. In the final secretarial recommendations announced in June 1980, Chaco Canyon was recommended for continued status as a Class II area. Any redesignation would require the approval of the State Governor, an eventuality considered unlikely by the task force.

The preponderence of evidence collected and analyzed by OTA during this study supports the task force assertion that coal mining development and expansion on existing leases would not violate air pollution standards.

Water Resources

The availability of water limits and defines all industrial and agricultural development in the West, particularly in the extremely dry Southwest. Surface waters are virtually nonexistent near most coal regions. Readily accessible ground water is scarce. Water from deep underground formations is often of such poor quality that its usefulness is limited. Moreover, the use of water is strictly defined by a host of state and federal laws, and water rights and conflicts are often hotly contested. Rainfall in many parts of the west is less than ten inches per year, and even the wettest regions in New Mexico receive only 16 inches annually. The low rainfall can seriously hamper reclamation efforts.

The currently active mines on two lease blocks have obtained water rights sufficient for mine operations. In addition, task force members believed that adequate water supplies would be available for the proposed mines on three additional tracts. Water availability is not an important factor for the development of seven small lease blocks which contain small quantities of underground mineable reserves.

Water shortages would most directly effect development in the Star Lake-Bisti region of the San Juan Basin. Full development of the coal resources, including three existing lease blocks, as well as the associated community and industrial infrastructures needed to support the mines, could seriously strain available water supplies. Some level of maximum development will be defined by water availability, but at this time, it is uncertain whether the potential

water limitation will affect the future development of existing leases.

In addition to strains on available water supplies, possible impairments to hydrologic conditions must also be considered. In some cases, mining of coal seams which support aquifers facilitates draining upslope water or permanently depleting downslope supplies. In other cases, aquifers with poor water quality may be disrupted so that downslope waters are actually polluted by mining operations. The disruption of natural aquifers and their dependent hydrological system are of particular concern in the San Juan Basin, because aquifers are of distinctly different quality. According to hydrologists with the BLM and the state of New Mexico, shallow surface mining activities would not seriously disrupt aquifers. More serious conflicts would arise when competing users draw water from deep aquifers to mine coal or burn the fuel in power plants. Water quality in some deep aquifers is not acceptable for domestic purposes or reclamation. Because the State of New Mexico regulates water rights, mine operators would have to receive necessary permits from the State Engineers Office for their water needs.

Community Impacts

The degree of adverse socioeconomic impacts from coal development in New Mexico is directly linked to the pace and location of development, the policies and programs of the state and federal governments, and the participation of coal developers in community planning.

Large-scale coal mining and conversion in New Mexico could severely strain the state's existing social and economic infrastructures as people move in to staff the new industries and as industries themselves compete with local economic forces. (See Appendix for estimates of expected employment at proposed new mines.) This issue is further complicated by the sparse or

nonexistent community infrastructures within the remote coal regions that are slated for the greatest development. Socioeconomic impacts threaten to be particularly severe in the Star Lake-Bisti region site of three lease blocks; in the eastern edge of the Fruitland Formation where development could occur on one to three blocks; and near Farmington in the northwest corner of the stae.

The New Mexico Community Assistance Act of 1977 created a seven-member Community Assistance Council authorized to make grants to minimize adverse socioeconomic impacts from energy development. Monies for the Council are obtained from the state's severance and resource excise tax collections on coal (which totaled $7.6 million in 1979), from New Mexico's share of Section 601 program funds authorized under the Federal Coal Conversion Act, and from other federal and state programs. In its first three years of operation, the community assistance program has issued over $19 million in grants to energy-impacted regions.

CHAPTER III

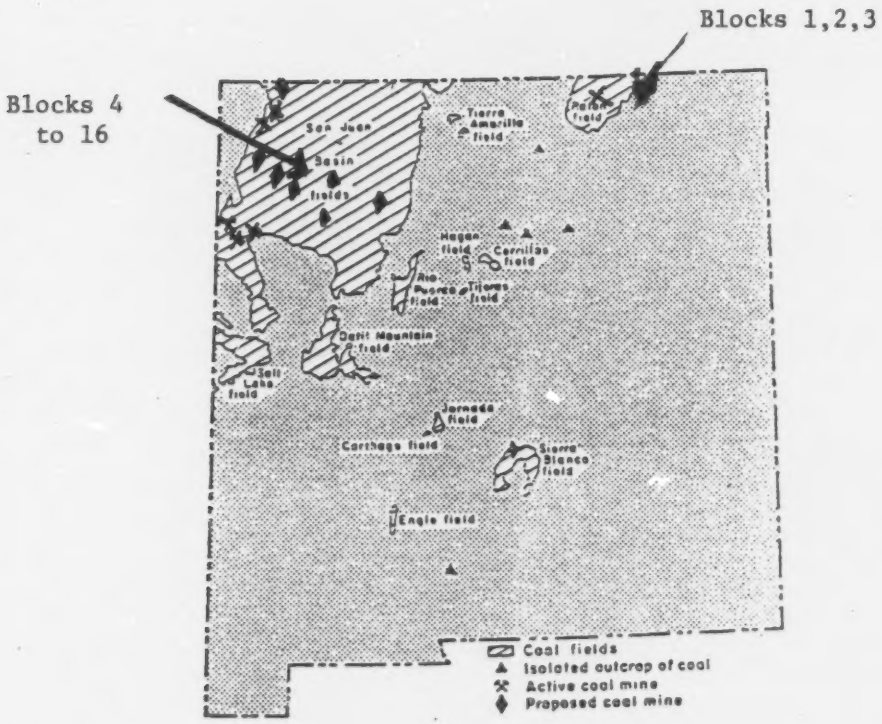
OTA ANALYSIS OF DEVELOPMENT POTENTIAL OF EXISTING NEW MEXICO FEDERAL COAL LEASES

There are 29 existing federal coal leases in New Mexico covering 44,760 acres with about 447 million tons of recoverable coal reserves. The 28 pending preference right lease applications cover an additional 77,590 acres and more than 1.5 billion tons of recoverable reserves (see Table 3-1). Three of the leases are located in the Raton Mesa Coal basin in northeast New Mexico. (See Figure 3-1.) The rest of the federal leases are located in the San Juan Coal Region in northwestern New Mexico. There are 9 federal leases associated with the 2 currently active mines, another 9 leases are in 3 pending mine plans and 11 leases have no mine plans. After September 30, 1980, 2 additional mine plans were submitted to the Department of the Interior. At least 15 of the non-producing leases have produced coal in the past.

In 1980, federal coal reserves in New Mexico produced over 6.3 million tons out of total state production of 16.5 million tons. Proposed mines on 11 leases contain over 300 million tons of recoverable coal reserves. However, the prospects for development of some of these proposed mines and for the 9 leases that have no mine plans are uncertain. To assist OTA in evaluating federal coal development in New Mexico, both inactive leases and leases in proposed mine plans were reviewed by the New Mexico task force. Before the task force meeting, OTA prepared an initial evaluation of all New Mexico leases. OTA's evaluation of New Mexico federal leases, as well as the task force assessments of prospects for development on federal land, are summarized in this chapter.

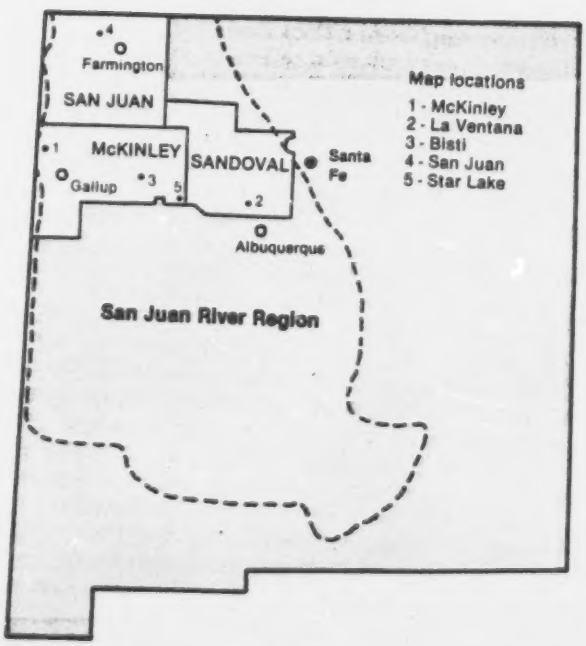
FIGURE 3-1

COAL FIELDS IN NEW MEXICO



COAL MINES ON FEDERAL LANDS

IN NEW MEXICO



SOURCE: Office of Technology Assessment.

Table 3-1

Federal Coal Leases and Preference Right Lease Applications
in New Mexico, Sept. 30, 1980

Region	Number	Acres	Recoverable Reserves (millions of tons)
San Juan Region			
Leases	26	44,560	446.7
PRLA's	28	77,590	1,499.4
Raton Mesa Region			
Leases	3	200	0.5
PRLA's	0	0	0
New Mexico Total			
Leases	29	44,760	447.2
PRLAs	28	77,590	1,499.4

Source: OTA

OTA Initial Evaluation

OTA first grouped contiguous or nearly contiguous leases held by the same lessee into development "blocks" that approximate viable mining units. The lease blocks include only federal leases. State and private lands that are intermingled with the federal leases and associated preference right lease applications were excluded at this stage of analysis. Additional reserves from both federal and non-federal sources will be considered as part of the final assessment of lease development potential.

Using these criteria, the 29 New Mexico leases were grouped into 16 lease blocks, each block containing from one to five leases. Thirteen blocks are in the San Juan region and three blocks in the Raton Mesa region. The 16 lease blocks are showned on Table 3-2. Two of the lease blocks are active mines: Gulf Oil's McKinley Mine near Gallup, and Western Coal Company's San Juan Mine near Farmington. The San Juan Mine lease block includes a new lease issued in April 1980. Mine plans for seven other lease blocks are in various stages of review or preparation. Eight lease blocks are inactive.

OTA Preliminary Screening of Lease Blocks

The 16 lease blocks were then classified according to whether or note they meet OTA's minimum threshhold criteria for viable new mines. OTA has established geological, ownership, and site-specific criteria or "screens" to determine whether a lease or lease blocks meet minimum threshhold characteristics for a new coal mining operation in New Mexico in the 1980s. (See Table 3-3.) The technical criteria were developed from information gleaned during OTA workshops and literature reviews, from an analysis of existing planned New Mexico surface and underground mines by the Colorado

TABLE 3-2

FEDERAL COAL LEASES IN NEW MEXICO

September 30, 1980

Block	Lessee	Serial No.	Date Issued	County	Acreage	Type Of Lease[1]	Mine Plan Status[2]
DENVER RATON MESA BASIN							
1	Barney Urtado	SF-042800	4/8/24	Colfax	40.7	P	N
2	Robert Lee Davis	SF-074673	1/10/41	Colfax	40	P	N
3	Texas Industries, Inc.	SF-066817	1/25/35	Colfax	120	C	N
SAN JUAN BASIN							
4	Gulf Oil Co. (McKinley Mine)	NM-057349	4/1/61	McKinley	2513.46	P	A
		NM-057348	4/1/61	McKinley	2485.12		A
		NM-0554844	1/1/64	McKinley	540.49	P	A
		NM-065466	1/1/64	McKinley	2560	P	A
5	Thermal Energy Co. Peabody Coal Co. (Chaco Energy Co.) (Star Lake Mine)	NM-2457	9/1/67	McKinley	6336.12	C	S
6	James L. Simmons	SF-076644	5/10/44	Rio Arriba	80	P	N
7	Ametex	SF-048323	7/19/29	Sandoval	120	P	N
8	Ametex	NM-732	2/1/67	Sandoval	160	C	N
9	Florentino Padilla	SF-075301	12/11/39	Sandoval	120	C	N
		SF-077779	5/1/49	Sandoval	40	C	N
10	Ideal Basic Industries, Inc. (La Ventana Mine)	NM-0510466	7/1/67	Sandoval	2002.06	P	S
		NM-0510467	7/1/67	Sandoval	2432.94	P	S
		NM-0510468	7/1/67	Sandoval	2505.47	P	S
		NM-0555316	2/1/69	Sandoval	160	P	S
		NM-0555317	12/1/64	Sandoval	2206.04	C	S
11	Cimarron Coal Co. (La Plata Mine)	NM-0315559	8/1/63	San Juan	2044.15	C	N*
12	Eastern Assoc Properties Fannin Square Corp. (Black Lake Mine)	NM-10931	1/1/70	San Juan	1910.20	P	N*
13	Floyd E. Ingraham	SF-077115	7/27/44	San Juan	160	P	N
14	Western Coal Co. (Bisti Mine)	NM-0186612	8/1/61	San Juan	2188.62	C	S
		NM-0186613	8/1/61	San Juan	1240	C	S
		NM-0186615	8/1/61	San Juan	2027.16	C	S
15	Western Coal Co. (San Juan Mine)	NM-045197	11/1/61	San Juan	2565.60	P	A
		NM-045217	11/1/61	San Juan	1800	P	A
		NM-045196	11/1/61	San Juan	2467.24	P	A
	(San Juan Underground)	NM-28093	4/1/80	San Juan	3856	C	A**
16	Western Coal Co.	SF-071448	6/11/40	San Juan	40	P	A**

[1]Origin of Lease: (C) = Competitive Bid, (P) = Preference Right Lease Application

[2]Mine Plan Status: (A) = Approved, (S) = Submitted (includes inactive plans), (N) = No Plan
(A**) = Lease is included in San Juan Mine Extension, (N*) = Mine Plan filed after 9/30/80.

TABLE 3-3

OTA INITIAL SCREENING PROCESS FOR UNDEVELOPED FEDERAL LEASES IN NEW MEXICO

MINE TYPE	RECOVERABLE RESERVES	COAL QUALITY	GEOLOGY	CAPITAL INVESTMENT
Case 1 San Juan Basin Large surface or underground mine producing coal for electric utilities. Production: 1 million tons/yr. Mine life: 30 years	30 million tons	BTU/Lb. > 7500 Sulfur % < 1.5 % Ash % < 25%	Total Seam Thickness: Surface > 6' Underground > 6' Overburden: < 150' (strip) > 250' (deep) Seam Dip: < 8°	Surface Mine: $10-$15 million Underground Mine: $10-$15 million
Case 2 San Juan Basin Small surface or undeground mine producing coal for industrial use, spot markets, or special purposes. Production: 100,000 tons/yr. Mine life: 25 yrs.	2.5 million tons	BTU/Lb. > 7500 Sulfur % < 1.5% Ash % < 15%	Total Seam Thickness: Surface > 3' Underground > 5' Overburden: < 150' (strip) > 250' (deep) Seam Dip: < 15°	Surface Mine: $5-$10 million Underground Mine: $5-$10 million
Case 3 Raton Mesa Region Large undergound mine for industrial (metallurgical) purposes. Production: 1 million tons/yr. Mine life: 30 years	30 million tons	BTU/Lb. > 12,000 Sulfur % < 1.0% Ash % < 15%	Total Seam Thickness: > 3' Surface — Underground > 3' Overburden: > 250' Seam Dip: < 15°	Surface Mine: — Underground Mine: $20-$30 million

School of Mines Research Institute, and from discussions with federal and state officials and OTA advisory panel members. (A more detailed description of the screening criteria appears in the Appendix.) The screens can be summarized as follows:

1. Logical mining unit. Is the lease block compact and contiguous and under single ownership to allow for orderly development as a mining unit?
2. Coal reserves. Are the recoverable coal reserves within the lease block sufficient to support a competitively sized new mining operation?
3. Coal quality. Do the coal reserves meet minimum Btu, sulfur, and ash quality standards for the expected end use (e.g., steam coal, industrial use, synthetic fuels)?
4. Geological characteristics. Do the geological and topographical conditions of the coal reserve--such as seam thickness and dip--permit efficient mine design and economic coal recovery?
5. Ownership. Does the lessee have the financial capability and/or mining expertise to develop the lease block?

The OTA screens were developed and applied to the undeveloped lease blocks before the New Mexico task force. The screens were modified based on discussions with geologists and mining experts at the task force. The minimum coal quality standards for heat value (Btu/lb.) and ash content were reduced to reflect currently accepted marketable coal requirements. The screens were then reapplied using the revised criteria and additional information provided by the task force. The slight modifications did not affect the results of the preliminary evaluations. The results of the screening are shown in Table 3-4.

TABLE 3-4 RESULTS OF OTA INITIAL EVALUATION OF FEDERAL COAL LEASES IN NEW MEXICO

Block #	Lessee	Number of Leases in Block	Acres	County	Passes Mining Unit Screen?	Passes Reserves Screen?	Passes Coal Quality Screens?	Passes All Geologic Screens?	Passes Ownership Investment Screen?	Passes All Screens?
RATON MESA REGION										
1	Barney Urtado *	1	40.7	Colfax	Yes	No	Yes	Yes	No	No
2	Robert L. Davis *	1	40	Colfax	Yes	No	Yes	Yes	No	No
3	Texas Industries *	1	120	Colfax	Yes	No	No	Yes	Yes	No
SAN JUAN RIVER REGION										
4	Gulf Oil Corp. (McKinley Mine)	4	8099.07	McKinley	Yes	Yes	Yes	Yes	Yes	Yes
5	Thermal Energy Co. Peabody Coal Co. Chaco Energy Co. (Star Lake Mine)	1	6336.12	McKinley	Yes	Yes	Yes	Yes	Yes	Yes
6	James Simmons *	1	80	Rio Arriba	Yes	No	Yes	No	No	No
7	Ametex *	1	160	Sandoval	Yes	No	Yes	Yes	No	No
8	Ametex *	1	120	Sandoval	Yes	No	Yes	Yes	No	No
9	Florentino Padilla *	2	160	Sandoval	Yes	No	No	Yes	No	No
10	Ideal Basic Industries (La Ventana Mine)	5	9306.51	Sandoval	Yes	Yes	Yes [b]	Yes	Yes	Yes
11	Cimarron Coal Co. (La Plata Mine)	1 1	2044.15	San Juan San Juan	Yes	Yes [a]	Yes	Yes	Yes	Yes
12	Eastern Associates Fannin Square Corp.	1	1910.20	San Juan	Yes	Yes	Yes	Yes	Yes	Yes
13	Floyd E. Ingraham *	1	160	San Juan	Yes	No	Yes	No	No	No
14	Western Coal Co. (Bisti Mine)	3	5455.76	San Juan	Yes	Yes	Yes	Yes	Yes	Yes
15	Western Coal Co. (San Juan Mine)	4	10,688.84	San Juan	Yes	Yes	Yes	Yes	Yes	Yes
16	Western Coal Co. (San Juan Mine) *	1	40	San Juan	Yes	No	Yes	Yes	Yes	No

a/ Block passed revised reserve screen based on information on additional reserves provided by task force.

b/ Block passed coal quality based on additional information on sulfur % provided by task force.

*/ Previously operated as a small mine.

Seven of the 16 lease blocks--including the two active mines--passed all of the revised OTA threshhold screens. Nine lease blocks failed to pass at least one screen.

Failure to pass the initial screens, however, does not necessarily mean that a lease block cannot be developed. For example, a block with insufficient reserves to support a large mine might sustain a small mining operation or might be combined with adjacent federal or non-federal lands to form a larger, more viable mining unit. Coal reserves with sulfur or ash contents that are too high for steam coal use could be suitable for local domestic or industrial use. These alternative development possibilities are limited, however, and were not included in the initial screening. OTA will incorporate information provided by the task force or other sources on the probability of such development on specific lease blocks in subsequent analyses.

Seven of the 9 lease blocks did not survive both the reserves and ownership tests. Six of the seven blocks previously supported small underground mining operations which have been shut down. Five of these blocks are now owned by individuals without the financial resources to initiate mining.* The other two blocks are owned by a small company, also without financial resources or mining expertise. One block (#9) with two leases failed the reserves, ownership, and coal quality (high % sulfur) tests. This block is owned by an individual and previously had operated as a small mine.

Two blocks that passed the ownership screens, failed the reserves screens

*Information on the financial capabilities and experience of the lessees was obtained from BLM lease files and, for most of New Mexico leases, from interviews with the lessees.

and were inititally rated as unfavorable (#11,16). This classification was changed based upon information which the task force provided about the availability of adjacent reserves. Two blocks passed the initial screens based on information provided by the task force that supplemented the limited reserves and coal quality data obtained from the Department of the Interior (#10,11). Both of these blocks are in advanced stages of mine plan preparation and review.

One lease block, Western Coal Co.'s Bisti leases (#14) though rated as favorable, has a potentially critical land-use conflict with a Wilderness Study Area which overlaps a large portion of the block.

OTA made substantial changes between its initial and final evaluations for some blocks based upon information obtained from the task force and subsequent analyses. The rationales behind these changes are explained in the following sections.

The New Mexico Task Force

To assist OTA in defining the development potential of leases and to identify conditions that might influence various development scenarios, OTA convened a series of meetings in New Mexico attended by coal experts familiar with the status of coal development within the state. The New Mexico task force meetings took place in Santa Fe on August 25 through 28, 1980. (A list of participants in these meetings appears in the Appendix.)

OTA adopted a process for reviewing federal leases at task force meetings that approximates the approach that a prudent developer would use in evaluating a property. First, the participants adopted a set of minimum requirements for new viable mining operations. The OTA revised its screens

incorporating these requirements. Secondly, the task force defined the expected optimum market demand for New Mexico coal during the next decade. The task force market scenario is discussed in the section on coal production potential. Having agreed on uniform criteria for developable mine properties and having identified the major assumptions about future markets, the task force then proceeded to assess the prospects for development of each lease block.

After determining whether each block met minimum requirements for development, the task force was asked to consider other factors that can affect the tract's development prospects. These factors include ownership of surface rights on the leased land or adjacent lands, the prospective marketability of the coal, transportation availability, regional or local geological or engineering conditions that could limit coal recoverability, availability of supporting facilities and community infrastructure, air quality considerations, water quality and availability, surface management and resource protection requirements.

The task force participants were asked to use their best professional judgment in assigning each lease block to one of three categories of development prospects and in identifying possible changes that might alter their overall evaluation. The categories are:

1. Favorable development prospects. The lease block meets OTA or task force threshhold criteria for a viable mining operation; mine development is expected to comply with all operating and reclamation requirements; there are no major technical or permitting problems or uncertainties associated with lease development.

2. Uncertain development prospects. The lease block has generally favorable mining characteristics, but uncertain development prospects because: a) development is contingent on the resolution of uncertainties that are external to the mineability of the lease block; b) additional information or analysis is required to evaluate

the development potential of the lease; or c) the task force was unable to agree on the probable impact of a potential impediment to development.

3. Unfavorable development prospects. The lease block has generally unfavorable development prospects because it does not pass the OTA or task force threshhold criteria for a viable mining operation and/or there are major technial or permitting problems associated with lease development.

The task force conclusions are shown in Table 3-5. The New Mexico task force participants rated 7 of the 16 lease blocks as favorable development prospects, 6 as unfavorable prospects, and 3 as uncertain prospects. The task force classified 7 lease blocks passing all the initial OTA screens as favorable. Two of these blocks (#4,15) are active mining operations--the San Juan and McKinley mines. One block (#11) is a planned new mine to serve an existing power plant. Two blocks were rated as favorable (#5,6) with the assumptions that the Star Lake Railroad would be built to connect the lease blocks to potential export markets and that such out-of-state markets for the coal would be found. Alternatively, the task force concluded that the possibility of a synfuels complex involving one of these lease tracts (#12) justified the favorable ratings.

The task force rated one small tract (#16) that failed the initial reserves test as favorable because the lessee controls the adjacent fee lands. A mine plan modification is being prepared to include this lease and these fee lands in an expansion of the existing San Juan mine. Another block (#14) held by Western Coal Company, was rated uncertain by the task force, although it met all initial requirements. Two of the three leases in this block have substantial surface resources conflicts involving wilderness study areas, paleontological and archeological sites, and Navajo surface occupants that remain to be resolved. The task force believes that the lessee will not

TABLE 3-5

SUMMARY OF LEASE BLOCK ANALYSES

Lease Block	Lessee	Does Block Pass OTA Screens?	Task Force Evaluation	OTA Final Evaluation	OTA Group Rating	1980 Production Status * (Capacity in 10^6 tons/year)	Task Force Estimate of 1985 Production Status *	Task Force Estimate of 1990 Production Status *
1	BARNEY URTADO	No	-	?	C	I	I	I
2	ROBERT DAVIS	No	-	-	D	I	I	I
3	TEXAS INDUSTRIES	No	-	?	C	I	I	I
4	GULF OIL CORP.	Yes	+	+	A	2.0	2.0	2.0
5	THERMAL ENERGY CO. & PEABODY COAL CO.	Yes	+	?	B	I	I	3.0
6	JAMES SIMMONS	No	-	-	D	I	I	I
7	AMETEX CORP.	No	-	-	D	I	I	I
8	AMETEX CORP.	No	?	?	C	I	neg.	neg.
9	FLORENTINO PADILLA	No	?	?	C	I	neg.	neg.
10	IDEAL BASIC INDUSTRIES, INC.	Yes	+	+	A	I	1.5	1.5
11	CIMARRON COAL CO.	Yes	+	+	A	I	2.0	2.0
12	EASTERN ASSOC. PROP. & FANNIN SQUARE CORP.	Yes	+	?	B	I	I	6.0
13	FLOYD INGRAHAM	No	-	-	D	I	I	I
14	WESTERN COAL CO.	Yes	?	?	B	I	0.5	5.0
15	WESTERN COAL CO.	Yes	+	+	A	4.0	4.0	4.0
16	WESTERN COAL CO.	No	+	+	A	I	neg	I

\+ = Favorable development prospects
? = Uncertain development prospects
\- = Unfavorable development prospects

* = Federal production only
I = inactive (no mining)
A,B,C,D, = See text.
neg. = negligible production

proceed with long-range development plans for the remaining lease areas until either the surface resource conflicts are resolved or additional reserves are made available through exchange. The lessee has announced that production from these leases would supply its proposed 2,000 megawatt New Mexico generating station. The time table for construction of that new power plant is uncertain. Some production from the proposed mine would also be trucked to the existing San Juan generating station.

Lease block #10, the proposed La Ventana underground mine, was rated as favorable despite the relatively higher sulfur content of its coal reserves (up to 1.6% sulfur) because the coal would be used in cement plants rather than electric generating plants. Coal from the mine would be shipped by truck to the lessees cement plants near Albuquerque.

Six of the lease blocks that did not pass the screening tests were rated unfavorable by the task force (Blocks 1,2,3,6,7, and 13). All 6 blocks are single leases of less than 200 acres with reserves that are insufficient to sustain long-term mining. Five of the six blocks are owned by individuals and one by a small company with no mining experience. There is no known market for coal from these isolated tracts; all have difficult access problems and inadequate coal transportation facilities. Several blocks also have safety hazards identified during previous mining operations. The 6 lease blocks rated as unfavorable contain less than 1% of the recoverable coal reserves under lease.

Finally, the task force assigned an uncertain development prospect to 2 lease blocks (#8,9) and did not pass the preliminary OTA reserves and ownership screens. Both blocks are adjacent to block #10 for which a mine plan has been submitted to the OSM for approval. The task force members

believe that because of reported negotiations, the possibility that the mine developer would incorporate the two lease tracts with additional strippable reserves into its much larger underground proposal was sufficiently high to warrant an uncertain rating for the lease. The task force agreed that the two blocks could not sustain viable independent mining operations.

OTA Evaluations

After the task force, OTA reviewed task force evaluations of the development prospects of each lease block and made a final rating for each using the same criteria that the task force had employed for favorable, uncertain, and unfavorable designations. These OTA evaluations are shown in Table 3-5. Four task force evaluations were modified by OTA in this final review.

Five lease blocks were rated as favorable, seven were rated as uncertain, and four were determined to have unfavorable development prospects. The two lease blocks repreenting active mining operations and two blocks with pending mine plans received favorable ratings in the OTA initial, the task force, and the OTA final evaluations. Four lease blocks--three owned by individuals and one by a small company--received unfavorable evaluations in all three analyses. In terms of reserves, however, the four unfavorable blocks contain only 800,000 tons of coal, a small fraction of one percent of the reserves under lease. The five favorable tracts, on the other hand, cover about 285 million tons, or 64% of leased reserves. The seven uncertain tracts cover about 162 million tons, or 36% of the leased reserves.

Three lease blocks in the Star Lake-Bisti region of the San Juan basin (#5,12, and 14) were rated as uncertain development prospects in the OTA re-evaluation, although two of the three received favorable ratings by the task

force. While all three tracts are mineable coal properties, development on two blocks (#5,12) is contingent on the completion of the proposed Star Lake Railroad, the emergence of large new mine-mouth coal conversion facilities or expanded out-of-state markets for coal. Potentially serious land-use conflicts affect the third block (#14). Development of all three could be limited or delayed by reclamation difficulties, water shortages, and adverse socioeconomic impacts.

OTA concurred in the judgement of the task force that two small tracts (#8,9)--unfavorable for mining by themselves--have uncertain development prospects because they adjoin a block (#10) for which an underground mining plans has been submitted for approval by OSM. This mine was characterized as a "model plan" by state and USGS representatives. The mine developer is reported to be negotiating with the lessee for the two lease blocks and could incorproate them into the overall mining plan. The blocks probably would not be developed independently.

Two small blocks in the Raton Mesa field, which received unfavorable ratings by OTA and the task force, were changed to uncertain in the OTA final review. One block (#1) may be re-assigned to a large company owning considerable quantities of coal on adjacent land. This block would provide access to the larger non-federal reserves. The second block (#3) was re-evaluated because no major obstacles exist to reopen a small mining operation for captive and spot markets. This block was assigned in 1976 to a large corporation with coal mining experience and considerable internal coal requirements.

Coal Production Potential

During the New Mexico task force meetings, OTA asked participants to estimate the production capacity for 1985 and 1990 for each of the lease blocks rated as favorable. (See Table 3-5.) These production capacity estimates provide an assessment of what these New Mexico federal leases could produce. The task force also estimated the overall market for New Mexico coal for those years. These market estimates are discussed in Chapter II. In making these judgments, the task force made the following assumptions:

1. The Star Lake Railroad would be completed by 1984.
2. A substantial out-of-state market for coal--approximately 25 million tons per year--would develop in Texas and the Gulf Coast.
3. Electric power demand within New Mexico would increase sufficiently to justify the construction of at least one additional large coal-burning power plant by the end of the decade.
4. No insurmountable land-use conflicts or environmental or socio-economic problems would reduce the overall level of state production.

The task force estimated that six lease blocks (#4,10,11,14,15,16) would be in production by 1985, contributing a combined coal output of 10 million tons per year. Two of these blocks (#4,15) are currently in production. The mining plan for a third (#10) is pending before the Department of the Interior. Mine plan development on a fourth block (#11)--to supply the San Juan power plant--was submitted after completion of initial task force report. The task force concluded that small-scale production would begin on an isolated tract (#14) near Bisti by 1985, although full-scale development will not occur until several uncertainties involving other leases in the block are resolved. Finally, limited additional production is anticipated from a 40-acre lease block as part of expanded operations on an active mine (#16).

The task force estimated potential production of 22.5 million tons from eight federal lease blocks by 1990. Production from five of the six blocks actively operating in 1985 would continue in 1990. The 40-acre tract (#16) would be mined out by 1990. Full scale production on two new operations in the Star Lake-Bisti region is contingent on the completion of the proposed railroad. Initial production on two of these blocks (#5,12) could begin by 1985, but full capacity will not be achieved until the 1990s.

The task force estimates new production capacity from federal leases of 4 million tons in 1985 and an additional 13.5 million tons by 1990. This amounts to an additional new production capacity that is nearly three times the existing mine capacity on federal lands of 6 million tons. The estimate does not include additional coal production capacity on fee, state, or Indian land, mining on unleased federal land, or the potential 12 million tons of annual production from the 28 pending preference right lease applications in the state.

The optimum coal development scenario outlined by the task force projects that mining will begin on all eight of the favorable lease blocks by 1990. The projection is a maximum coal development scenario for existing federal leases and admittedly is optimistic. The two small lease blocks (#8,9) rated as uncertain could contribute only negligible amounts of coal production. The remaining six unfavorable tracts (including 2 small leases in the Raton Mesa area rated by OTA as uncertain) are not expected to produce in the next decade.

How the Lease Evaluations Will Be Used - Plans for Further Analysis

The information and analyses assembled in the preparation of this report

will be used by OTA and its contractors in completing the tasks requested by the Congress--analyzing all mining activities on federal land, determining the development potential of existing leases, estimating federal revenues from rentals and royalties, and examinign the feasibility of certain deep mining technologies. This report and the lease evaluations made by OTA and the task force are a partial contribution to the assessment of existing federal leases. Additional analyses of the technical and economic factors that will influence the development of currently inactive leases are underway. OTA contractors are reviewing all mine plans submitted for federal leases. OTA will consult with federal lessees about their current plans for development and any difficulties the lessees have encountered. To guide further research, OTA has divided the New Mexico lease blocks into four groups according to their development prospects, the level of follow-up analysis planned to complete OTA's mandated tasks, and the relative importance of the blocks to the state's coal development future.

Group A--Active Mining Operations

Five New Mexico lease blocks (#4,10,11,15,16) with a total of 15 leases and containing 285 million tons of recoverable coal reserves were assigned to Group A. The Group A blocks include leases which are now producing or have a mining plan in the final stages of preparation and approval. The lease blocks received task force and final OTA favorable development prospect ratings and require no new transportation systems; are not likely to encounter major environmental, socioeconomic, or land-use conflicts; and have definite or likely markets for coal output.

Group B--Star Lake-Bisti Area Mine Proposals

Three lease blocks (#5,12,14) containing 5 leases and 161 million tons of reserves were grouped by OTA in this category. These three properties have large quantities of developable coal, but future mining is contingent on the construction of the Star Lake-Bisti railroad and/or mine-mouth coal complexes such as a large coal fired power plant or synfuels facility. Furthermore, all three blocks face environmental and market uncertainties, and one block has potentially severe surface conflicts. Nevertheless, all received either favorable or uncertain OTA and task force final evaluations; all are owned by companies capable of initiating large-scale mining; and all have recent or ongoing mine development activity.

The task force estimates that production in the three Group B blocks could contribute 14 million tons of coal per year by 1990--more than half the anticipated 22.5 million ton capacity from Federal leases. Because of the substantial production potential from these blocks, OTA will follow the progress of the Star Lake Railroad proposal and other related issues. A re-evaluation of the properties will be made if events alter the current uncertain status of these leases before preparation of OTA's final report. (Note: For OTA's final report, two of these blocks, #5 and 15, were considered as leases with pending mine plans. Block #12 was upgraded to favorable development prospects.)

Group C--Small Properties with Uncertain Development Futures

Four small leases (#1,3,8,9), each less than 200 acres, were rated as unfavorable by the task force and as uncertain by OTA. They cover substantially less than one percent of the coal reserves under lease.

Although coal was produced on all of these blocks, they are now inactive.

The owners of three of the four blocks--two individuals (#1,9) and one small company (#8)--were judged by OTA and the task force as having insufficient mining experience and financial resources to reopen the mines. The three blocks adjoin larger tracts of coal land controlled by active coal developers. If any of these blocks are assigned to the adjoining operation, the likelihood of development will increase substantially.

The fourth small lease in this category (#3) was acquired in 1976 by a company with both the financial and technical capabilities to open a mine and a need for coal for its other corporate activities. Although no coal mining plans have been announced for this property, OTA placed it in the C category because it appears to face no major obstacles to development. OTA will assess the technical feasibility of mining operations on these blocks under the special circumstances described. If, in fact, such assignments take place before OTA prepares its final report, the classifications will be re-evaluated. (Note: no changes were made in the final report.

Group D--Unfavorable Lease Blocks

This category includes four lease blocks of less than 200 acres each and covering less than one percent of the reserves under lease. All four blocks were rated as unfavorable by OTA and the task force. No compelling circumstances were identified that might change the evaluation.

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Congress of the United States
OFFICE OF TECHNOLOGY ASSESSMENT
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DIRECTOR

OTA Fact Sheet

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Revised September 1981

FEDERAL COAL LEASES IN NEW MEXICO

NEW MEXICO - San Juan

Block #	LESSEE: PARENT/SUBSIDIARY	LEASE BLOCK OR MINE NAME	MINE PLAN STATUS	NUMBER OF LEASES	SERIAL NUMBER	DATE	ACRES	COUNTY
4	Gulf Oil Corp./--	McKinley	Approved	4	NM057349	4/1/61	2513	McKinley
					NM057348	4/1/61	2485	
					NM0554844	1/1/64	540	
					NM065466	1/1/64	2560	
							8098	
15	Public Service Co. of New Mexico and Tucson Electric Co./ Western Coal Co.	San Juan	Approved	5	NM071448	6/11/40	40	San Juan
					NM045197	11/1/61	2565	
					NM045217	11/1/61	1800	
					NM045196	11/1/61	2467	
					NM28093	4/1/80	3856	
							10728	
10	Ideal Basic Industries, Inc./--	La Ventana	Pending	5	NM0510466	7/1/67	2002	Sandoval
					NM0510467	7/1/67	2433	
					NM0510468	7/1/67	2505	
					NM0555316	2/1/69	160	
					NM0555317	12/1/64	2206	
							9306	
5	Peabody Holding Co./Peabody Coal Co. and Thermal Energy Co./--	Star Lake	Pending	1	NM2457	9/1/67	6336	McKinley
14	Public Service Co. of New Mexico and Tucson Electric Co./ Western Coal Co.	Bisti	Pending	3	NM1086612	8/1/61	2188	San Juan
					NM0186613	8/1/61	1240	
					NM0186615	8/1/61	2027	
							5455	
7	Amtex Corp./--	--	Undeveloped	1	SF048323	7/19/29	120	Sandoval
8	Amtex Corp./--	--	Undeveloped	1	NM732	2/1/67	160	Sandoval
11	Cimmaron Coal Co./--	La Plata	Undeveloped	1	NM0315559	8/1/63	2044	San Juan
12	Eastern Gas & Fuel Associates/ Eastern Associated Properties Corp. and Texas Eastern Transmission Corp./Fannin Square Corp.	Black Lake	Undeveloped	1	NM10931	11/1/70	1910	San Juan
13	Ingraham, Floyd E./--	--	Undeveloped	1	SF077115	2/27/44	160	San Juan

NEW MEXICO - San Juan Region (continued) and Denver-Raton Mesa Region

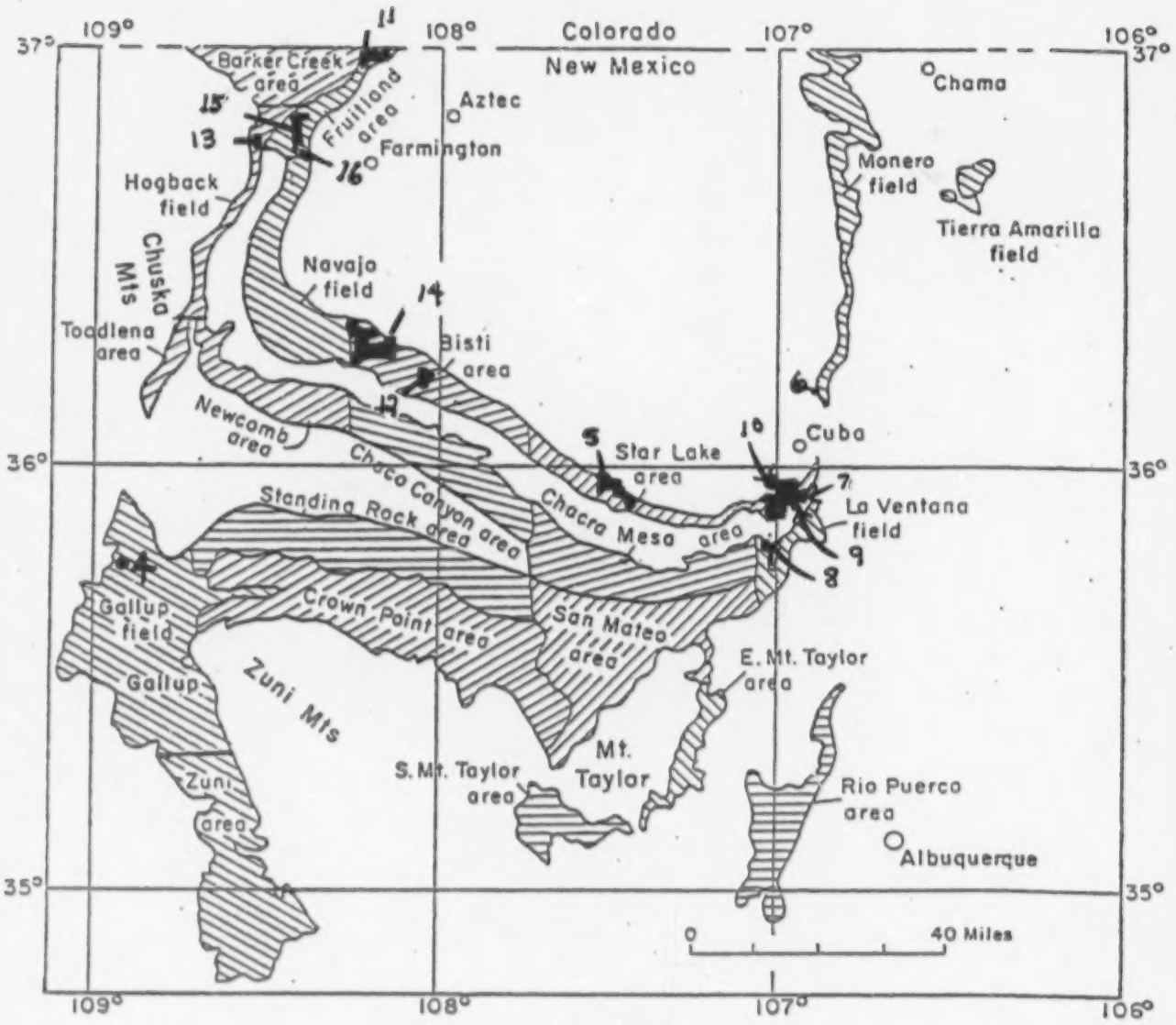
Block #	LESSEE: PARENT/SUBSIDIARY	LEASE BLOCK OR MINE NAME	MINE PLAN STATUS	NUMBER OF LEASES	SERIAL NUMBER	DATE	ACRES	COUNTY
9	Padilla, Florentino/--	--	Undeveloped	2	SF075321 SF077779	12/11/39 5/1/49	120 40 160	Sandoval
6	Simmons, James L./--	--	Undeveloped	1	SF076644	5/10/44	80	Rio Arriba
	Denver-Raton Mesa Region							
2	Davis, Robert Lee/--	--	Undeveloped	1	SF074673	1/10/41	40	Colfax
3	Texas Industries, Inc./--	--	Undeveloped	1	SF066817	1/25/35	120	Colfax
1	Urtado, Barney/--	--	Undeveloped	1	SF042800	4/8/24	41	Colfax

NEW MEXICO PREFERENCE RIGHT LEASE APPLICATIONS

Lessee	Serial Number	Date	County	Acres	Map #
Ark Land Co. &	NM3752	5/18/72	San Juan	3759.81	2P
Rogers Baggett	NM3753	5/18/72	San Juan	2950.78	
Ark Land Co. &	NM3754	5/18/72	San Juan	3075.32	2P
Arthur Stegelman	NM3755	5/18/72	San Juan	2587.70	
Ark Land Co. &	NM3918	5/18/72	San Juan	4476.66	2P
Robert Anderson	NM3919	5/18/72	San Juan	4478.24	
	NM8745	5/18/72	San Juan	520.00	
Eastern Associates &	NM3834	5/31/72	San Juan	4804.22	6P & 7P
Fannin Square Corp.	NM3835	5/31/72	San Juan	4499.84	
	NM3836	5/31/72	San Juan	5110.20	
	NM3837	5/31/72	San Juan	5120.00	
	NM3838	5/31/72	San Juan	4786.76	
	NM6801	12/27/72	San Juan	4394.28	
	NM6802	12/27/72	San Juan	339.98	
	NM6803	12/27/72	San Juan	5120.94	
	NM6804	12/27/72	San Juan	1601.56	
	NM7235	12/27/72	San Juan	160.00	
Freeman United Coal Mining	NM585	9/22/71	McKinley	2811.17	22P
H. Newton Cunningham	NM12324*	12/23/74	San Juan	480.27	5P
	NM8592*	12/19/74	San Juan	1600.00	
Kin-Ark Corp.	NM11916	11/29/73	San Juan	2880.00	25P
Thermal Energy Co. &	NM11670	3/8/72	San Juan	1118.55	7P & 21P
Peabody Coal Co.	NM8128	1/26/72	San Juan	4498.56	
	NM8129	3/8/72	San Juan	1520.36	
	NM8130	1/26/72	San Juan	2133.42	
	NM8715	1/26/72	San Juan	1921.00	
	NM8717	1/26/72	McKinley	600.00	
	NM9764	1/26/72	San Juan	240.00	

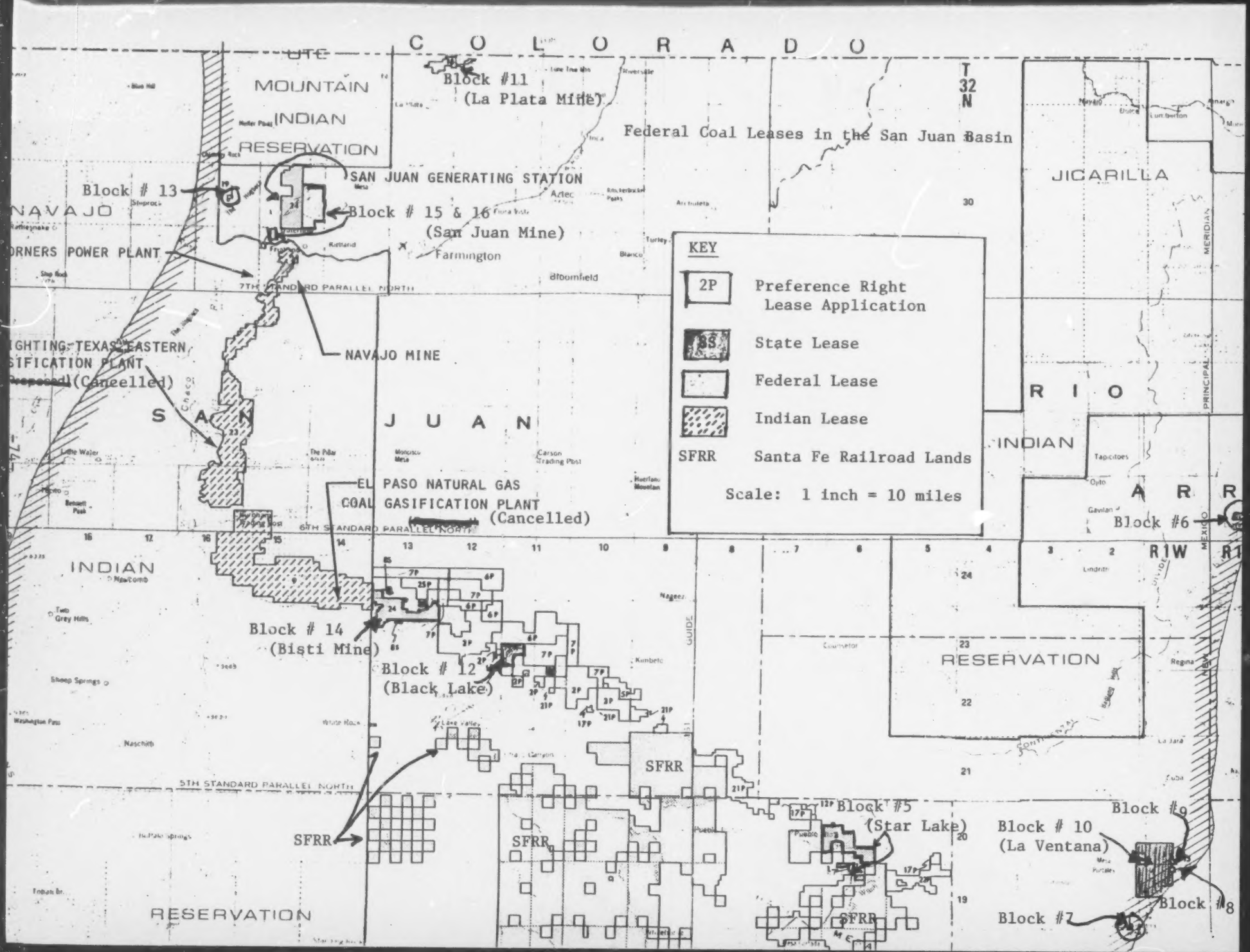
Source: United States Department of the Interior, Automated Coal Lease Data System, December, 1979

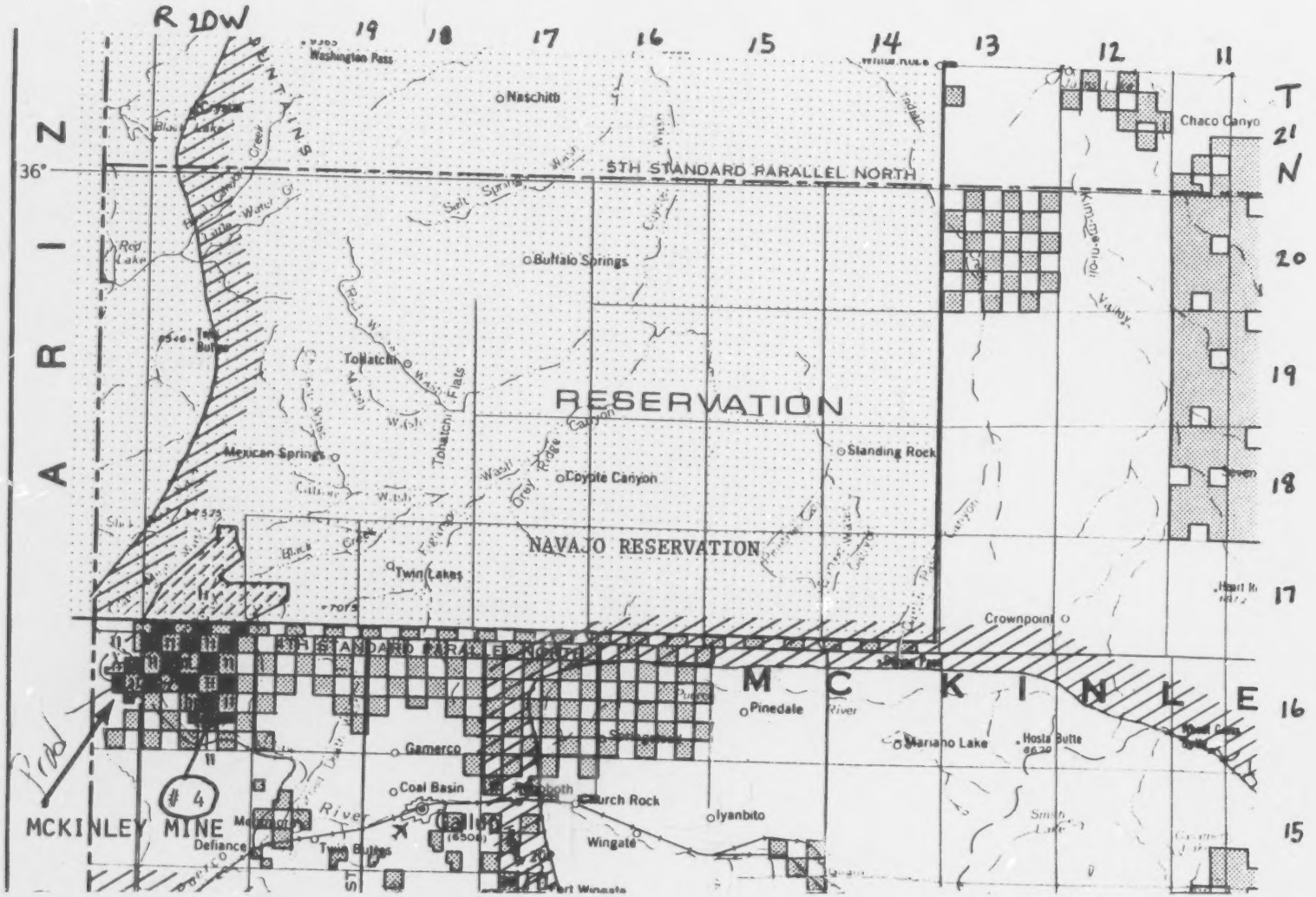
*Rejected



COAL FIELDS IN THE SAN JUAN BASIN

Numbers show approximate location of Federal Lease Blocks


Federal Coal Leases in the San Juan Basin
C O L O R A D O
UTE MOUNTAIN INDIAN RESERVATION
Block #11 (La Plata Mine)
T 32 N
SAN JUAN GENERATING STATION
Block # 13
Block # 15 & 16 (San Juan Mine)
NAVAJO
JICARILLA
Farmington
Aztec
Bloomfield
Turley
Blanco
7TH STANDARD PARALLEL NORTH
NAVAJO MINE
S A N J U A N
R I O
INDIAN
EL PASO NATURAL GAS COAL GASIFICATION PLANT (Cancelled)
6TH STANDARD PARALLEL NORTH
Block #6
R1W
INDIAN
Block # 14 (Bisti Mine)
Block # 12 (Black Lake)
RESERVATION
SFRR
5TH STANDARD PARALLEL NORTH
Block #5 (Star Lake)
Block #9
Block # 10 (La Ventana)
Block #8
Block #7
RESERVATION
KEY
2P Preference Right Lease Application
SS State Lease
Federal Lease
Indian Lease
SFRR Santa Fe Railroad Lands
Scale: 1 inch = 10 miles



Federal Leases

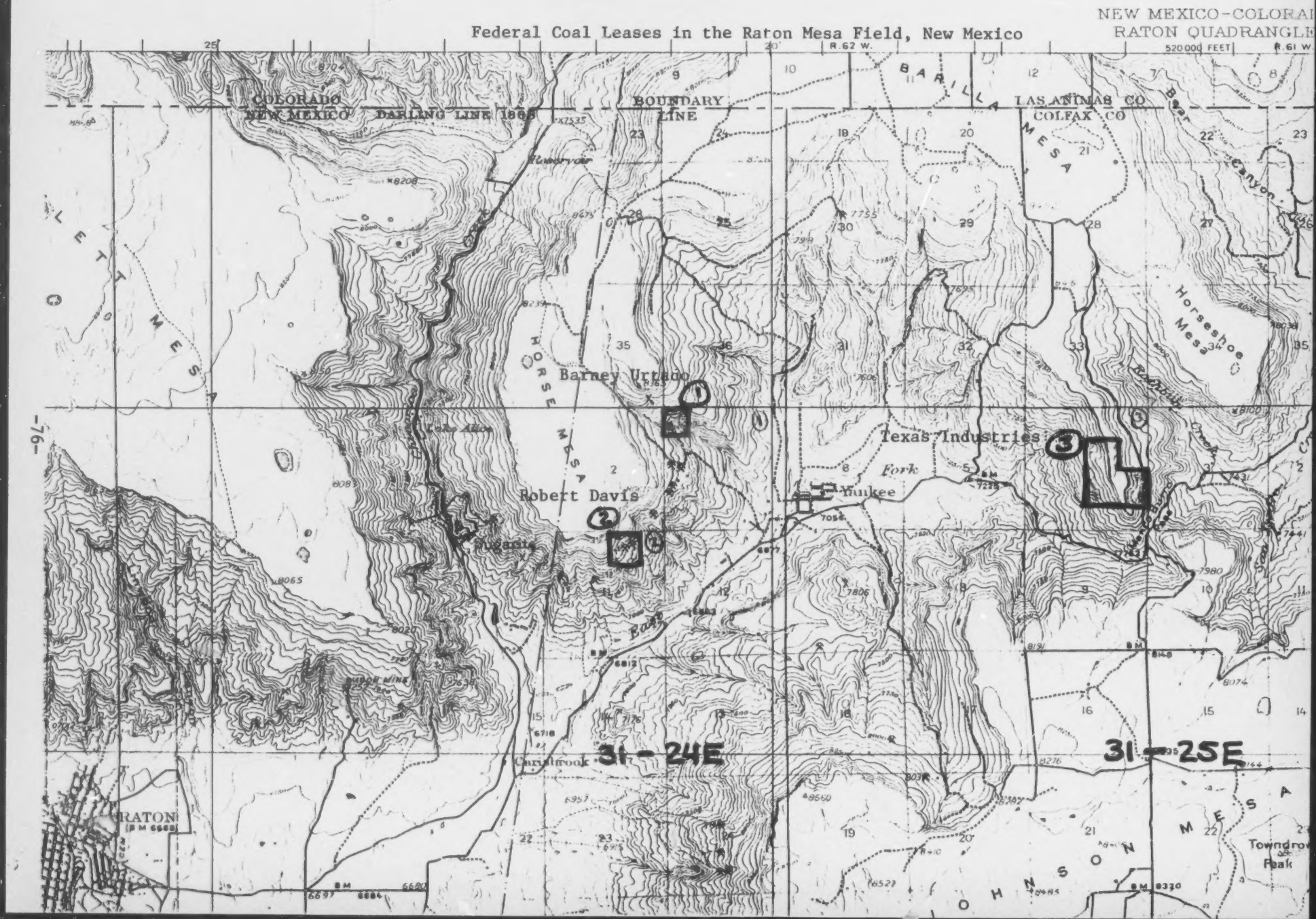
SFRR coal lands

Fee Land and Tribal Fee land

Indian leases

Federal Coal Leases in the Southern San Juan Basin

BLOCKS #1-3


Federal Coal Leases in the Raton Mesa Field, New Mexico
NEW MEXICO-COLORAD
RATON QUADRANGLE
520000 FEET
R.62 W.
R.61 W
COLORADO
NEW MEXICO
DARLING LINE 1866
BOUNDARY LINE
LAS ANIMAS CO
COLFAX CO
BARILLA MESA
Bear Canyon
LETTO MESA
HORSE MESA
Horseshoe Mesa
Barney Urrado
Texas Industries
Robert Davis
Yankee
Fork
Carlsbrook
31-24E
31-25E
RATON
JOHNSON MESA
Towndrow Peak
-76-

FEDERAL COAL LEASES IN NEW MEXICO

Summary of Coal Characteristics

Lease Block	Lessee	Number of Leases	County	Acres	Recoverable Reserves (mt)*	Mine Type	BTU/Lb.	% Sulfur	% Ash	Dip
1	BARNEY URTADO	1	Colfax	40.7	<0.1	U	13,350	0.5	6.5	1
2	ROBERT DAVIS	1	Colfax	40	<0.1	U	13,350	0.5	6.6	1
3	TEXAS INDUSTRIES	1	Colfax	120	<0.5	U	10,300	0.5	18	
4	GULF OIL CORP.	4	McKinley	8,099	127.5	S	10,200	0.7	10.5	1
5	THERMAL ENERGY CO. & PEABODY COAL CO.	1	McKinley	6,336	38.4	S	8,657	0.6	22.7	1
6	JAMES SIMMONS	1	Rio Arriba	80	<0.1	U	12,240	0.6	4.4	28
7	AMETEX CORP.	1	Sandoval	160	<0.5	U	10,500	0.7-1.5	5-7	8-10
8	AMETEX CORP.	1	Sandoval	120	<0.5	U/S	10,500	0.7-1.5	5-7	8-10
9	FLORENTINO PADILLA	2	Sandoval	160	<0.5	U/S	10,310	2.1	4.8	10
10	IDEAL BASIC INDUSTRIES, INC.	5	Sandoval	9,306.5	55	U	10,550	1.6	7.0	4-7
11	CIMARRON COAL CO.	1	San Juan	2,044.2	60	S	11,700	0.9	12	6
12	EASTERN ASSOC. PROP. & FANNIN SQUARE CORP.	1	San Juan	1,910.2	33	S	9,800	0.8	18	1
13	FLOYD INGRAHAM	1	San Juan	160	<0.5	U	12,000	0.7	4	30-40
14	WESTERN COAL CO.	3	San Juan	5,455.8	88	S	8,840	0.6	18	1
15	WESTERN COAL CO.	4	San Juan	10,688.8	135	U&S	9,800	0.8	18	1
16	WESTERN COAL CO.	1	San Juan	40	<1.0	S	10,900	0.6	9.9	1

* (mt) = millions of tons.

INITIAL SCREENING PROCESS FOR UNDEVELOPED FEDERAL COAL LEASES: NEW MEXICO

•Criteria that are independent of coal region and mine profile

CRITERIA	RATIONALE	REFERENCES	INFORMATION SOURCES
1. All leases in the tract are held by the same owner.	Coal operators form mining units out of more than one lease - leases held by the same owner in the same area are presumed to have been acquired for purposes of development. Regulations require that all leases in a logical mining unit (LMU) be under the effective control of a single operator.	**DOI Coal Leasing Regulations** **43 CFR 3400.0-5(cc)** **43 CFR 3475.5**	Lease lists with ownership and location obtained from State BLM Offices and DOI coal lease data system (ACLDS)
2. The lease tract forms a compact and contiguous unit.	Mining units must be sufficiently compact and contiguous to allow for economy of operation and orderly sequence of mining. Regulations require that all leases in an LMU be contiguous - i.e. having at least one point in common.	**DOI Coal Leasing Regulations** **43 CFR 3400.0-5(cc)** **43 CFR 3400.0-5(k)**	Official public land records - coal plat maps from State BLM office and coal lease maps at various scales from USGS, BLM and state agencies.

•Criteria that vary with region and mine types (3 cases):

CASE 1 - SAN JUAN REGION--large predominantly surface, high production mining operations for mine mouth or other steam power plants.

1-3 The lease tract has sufficient recoverable reserves to support an average new mine; at least 1 MTY surface mine with 30 year life (30 million tons, total recoverable reserves).	Review of planned new mines indicates trend towards surface mining of at least 1 million tons/year aimed at steam coal markets; projected mine life of 25 years required to recover costs.	CSMRI mine survey and profile of anticipated mine requirements; consultations with USGS, New Mexico Bureau of Mines and Mineral Resources (NMBMMR)	Recoverable and in-place coal reserve estimates from USGS and from independent sources such as EIS's. OTA staff & consultant calculations. ACLDS (DOI-BLM) system.
1-4 Coal reserves meet minimum coal quality standards for expected end use (steam coal) (unwashed) • at least 7,500 BTU/lb for surface reserves • sulfur content of 1.5% or less • ash content of 25% or less	Coal quality characteristics reflect lower limits of BTU/lb, % sulfur, and % ash for marketable New Mexico coal over the next decade.	CSMRI mine survey and profiles of typical new mine requirements; consultations with USGS, NMBMMR, and coal industry sources.	Coal quality information from DOI coal lease data system plus supplementary information from EIS's and F.E.R.C. report summaries published in Coal Outlook.

CRITERIA	RATIONALE	REFERENCES	INFORMATION SOURCES
1.5 Geologic characteristics of the coal reserves and topographic conditions impose no restrictions on mine design or coal recovery. e.g., single/multiple seams are at least 72" in total thickness; dip at less than 8°; surface reserves are under 150 feet of overburden or less; underground reserves more than 250 feet.	Geo-engineering requirements for mine design and equipment make mining under certain conditions difficult and costly and limit recoverability. Conditions in New Mexico were identified based on consultations with NMBMMR concerning characteristics of the San Juan coal basin, equipment requirements, and current mining practices.	CSMRI mine survey; NMBMMR publications; consultations with USGS, NMBMMR and industry sources.	Geologic information from DOI automated coal data system; NMBMMR
1.6 Lessee has financial capability and/or mining experience to develop the tract. e.g., mining expertise or financial resources to support initial capital costs of $10 - $20 million for full scale operation.	Initial capital costs to open a new surface mine are estimated to be $15 million for a large mine (1 MTY). Lessee must be able to obtain financing for mine development - costs exclude lease acquisition.	A. Cornett, Colorado Mining Assoc. 1976 Mining Yearbook; DOE Energy Information Admin., Economic Analysis of Coal Mining Costs for Underground and Strip Operations; consultations with New Mexico state agencies. Presidents Commission on Coal data book	OTA study of federal leaseholders including information on individual and corporate lessees, current and past mining experience, and assets based on lessee disclosure statements in lease records, state corporation commissions, industry directories, direct interviews with lessees and coal industry sources, and investment services. Ownership information on file with BLM extracted and summarized by OTA contractor and supplemented by independent research in financial services. Direct contacts with lessees. Review of state agencies' public records.

CASE 2 - SAN JUAN REGION--small, surface or underground mining operations for industrial, spot market, or special purpose (e.g., for drilling mud) production.

CRITERIA	RATIONALE	REFERENCES	INFORMATION SOURCES
2-3 The lease tract has sufficient recoverable reserves to support an average new mine, at least 100,000 ton/year production from a deep mine with a life of 25 years (recoverable reserves of 2.5 million tons)	State people were interviewed: they suggested a trend in underground mining of at least 100,000 tons/year for industrial mines; projected mine life of 25 years required to recover costs.		
2-4 Coal reserves meet minimum coal quality standards for expected end use (steam coal) • at least 7,500 BTU/lb for underground reserves • sulfur content of 1.5% or less • ash content of 15% or less	Coal quality characteristics reflect lower limits of BTU/lb, % sulfur, and % ash to meet expected demand for New Mexico coal over next decade.		
2-5 Geologic characteristics of the coal reserves and topographic conditions do not impose restrictions on mine design or coal recovery. e.g., underground seams are at least 60" in total thickness; surface reserves are at least 36" thick.	Geo-engineering requirements for mine design and equipment make mining under certain conditions difficult and costly and limit recoverability. Conditions in New Mexico were identified based on consultation with USGS and NMBMMR concerning characteristics of the San Juan coal basin, equipment requirements, and current mining practices.	(REFERENCES AND INFORMATION SOURCES FOR CASES II AND III ARE THE SAME AS FOR CASE 1)	
2-6 Lessee has financial capability and/or mining experience to develop the tract. e.g., mining expertise or financial resources to support initial capital costs of $5 - $10 million.	Initial capital costs to open a new 500,000 ton/year deep mine are estimated at $23 million (1977 dollars). Lessee must be able to obtain financing for mine development.		

CASE 3 - RATON MESA REGION--large underground mining operations for metallurgical purposes.

	CRITERIA	RATIONALE	REFERENCES	INFORMATION SOURCES
3-3	The lease tract has sufficient recoverable reserves to support an average new mine, at least 1 million MTY deep mine with a life of 30 years (Recoverable reserves of 30 million tons)	No known plans for new mines in Raton Field; present mines in the area produce up to 800,000 tons/year. Future mines are likely to be somewhat larger.		
3-4	Coal reserves meet minimum coal quality standards for expected end use (steam coal) • at least 12,000 BTU/lb for underground reserves • sulfur content of 1.0% or less • ash content of 15% or less	Coal quality characteristics reflect lower limits of BTU/lb, % sulfur, and % ash to meet expected demand for New Mexico coal over next decade. Premium metallurgical coal is 1% S or less, and 8% ash or less; new developments may be limited to premium coal.		
3-5	Geologic characteristics of the coal reserves and topographic conditions do not impose restrictions on mine design or coal recovery. e.g., underground seams are at least 36" thick and coal beds dip at less than 15°; underground reserves are under 250 feet or more of overburden.	Geo-engineering requirements for mine design and equipment make mining under certain conditions difficult and costly and limit recoverability. Conditions in New Mexico were identified based on consultation with USGS and NMBMMR concerning characteristics of the Raton coal basin, equipment requirements, and current mining practices.	(REFERENCES AND INFORMATION SOURCES FOR CASES II AND III ARE THE SAME AS FOR CASE I)	
3-6	Lessee has financial capability and/or mining experience to develop the tract. e.g., mining expertise or financial resources to support initial capital costs of $20 - $30 million.	Initial capital costs to open a new 500,000 ton/year deep mine are estimated at $23 million (1977 dollars). Lessee must be able to obtain financing for mine development.		

U.S. Department of Energy

WESTERN COAL SURVEY 1981

PERIODIC SUMMARY

STATE OF NEW MEXICO

	OPERATION	ACTUAL PRODUCTION	PRODUCTIVE CAPACITY: MILLION TONS PER/YEAR											
		78	80	81	82	83	84	85	86	87	88	89	90	
	Colfax County													
	KAISER STEEL York Canyon #1		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	U M
	KAISER STEEL W. York Strip		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	M
	County Total	0.7	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
	McKinley County													
	CARBON Coal Gamerco		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
	CHACO ENERGY Hospah		-	-	-	1.0	1.5	2.0	2.5	3.0	3.4	3.4	3.4	
(F,P)	CHACO ENERGY Star Lake		-	-	-	-	-	0.5	1.5	2.5	3.5	4.5	4.5	
(P)	FREEMAN UNITED COAL Star Lake East		-	-	-	-	0.5	1.0	1.5	2.0	2.5	2.5	2.5	
(F)	PITTSBURG & MIDWAY McKinley		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
	County Total	3.1	6.0	6.0	6.0	7.0	8.0	9.5	11.5	13.5	15.4	16.4	16.4	
	Sandoval County													
(F)	IBI COAL 1/ LaVentana		-	-	-	0.2	0.4	0.6	0.8	1.0	1.2	1.5	1.5	U
	San Juan County													
(P)	ARCH MINERALS Unit No. 1		-	-	-	-	-	1.0	2.0	3.0	3.0	3.0	3.0	
(P)	ARCH MINERALS Unit No. 2		-	-	-	-	-	-	1.0	2.0	3.0	3.0	3.0	
	CONSOL-EL PASO Burnham		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
	CONSOL-EL PASO East		-	-	-	-	-	-	-	1.0	3.0	5.0	5.0	
(F)	CIMARRON La Plata		*	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
	TEXAS EASTERN N.W. N.W. Synfuels**		-	-	-	-	-	-	-	-	-	4.5	10.6	
	TUSCON GAS & ELECTRIC Gallo Wash		-	-	-	-	0.7	2.8	2.8	2.8	2.8	2.8	2.8	
	UTAH INTERNATIONAL Navajo		6.8	6.7	6.8	6.6	6.7	6.7	6.7	6.7	6.7	6.7	6.7	
(F,P)	WESTERN ASSOC. Black Lake		-	-	-	2.5	3.3	3.3	3.3	3.3	3.3	3.3	3.3	
(F)	WESTERN COAL Bisti		-	-	-	-	-	0.3	0.3	0.3	1.2	2.4	2.4	
	WESTERN COAL De-Na-Zin		0.1	0.3	0.3	0.3	0.3	-	-	-	-	-	-	
(F)	WESTERN COAL San Juan		4.6	4.9	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.7	
(F)	WESTERN COAL San Juan Deep Mine		-	0.3	0.4	0.8	1.2	1.2	1.2	1.2	1.2	1.2	1.2	U
	County Total	8.8	11.7	13.6	10.7	13.4	15.4	18.5	20.4	23.4	27.3	35.0	41.1	
	State Total	12.6	19.2	21.1	18.2	22.1	25.3	30.1	36.2	39.4	45.4	54.4	60.5	
	Small mines	0.2												
	Large mines	12.4												

1/ Subsidiary of Ideal Basic Cement

* Less than 50,000 tons.
** Gasification proposal.

(F) Federal Lease
(P) Federal Preference Right Lease Application
(F,P) Federal Lease and Preference Right Lease Application.

U.S. DEPARTMENT OF ENERGY

WESTERN COAL SURVEY 1981

PERIODIC SUMMARY

STATE OF NEW MEXICO

OPERATION	COAL UNDER CONTRACT: MILLION TONS PER/YEAR										
	80	81	82	83	84	85	86	87	88	89	90
Colfax County											
KAISER STEEL York Canyon #1	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
KAISER STEEL W. York Strip	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
County Total	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
McKinley County											
CARBON COAL Gamerco	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
(F) PITTSBURG & MIDWAY McKinley	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
County Total	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Sandoval County											
(F) IBI COAL LaVentana	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
San Juan County											
(F) CIMARRON La Plata	*	0.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
TEXAS EASTERN N.W. N.M. Synfuels **	-	-	-	-	-	-	-	-	-	4.6	10.6
TUSCON GAS & ELECTRIC Gallo Wash	-	-	-	-	0.7	2.8	2.8	2.8	2.8	2.8	2.8
UTAH INTERNATIONAL Navajo	6.8	6.7	6.8	6.6	6.7	6.7	6.7	6.7	6.7	6.7	6.7
OTHERS	4.7	5.5	2.5	2.9	3.3	3.3	3.2	3.2	4.1	5.3	5.3
County Total	11.5	12.4	10.5	10.7	11.9	14.0	13.9	13.9	14.8	20.6	26.6
State Total	19.1	20.0	18.1	18.4	19.6	21.7	21.6	21.6	22.5	28.3	34.3
Less Synthetic Fuels Proposals	-	-	-	-	-	-	-	-	-	4.6	10.6
Firm Contracts	19.1	20.0	18.1	18.4	19.6	21.7	21.6	21.6	22.5	23.7	23.7

(F) Federal lease

* Less than 50,000 tons.
** Gasification Proposals are underlined.

Table 5. Coal Production Goals for 1985, 1990 and 1995 by Western States (million short tons)[a]

State	1985			1990			1995		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
E. No. Great Plains									
North Dakota	29.0	29.0	29.0	34.3	50.8	59.7	53.6	85.6	103.7
South Dakota	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	1.9
Eastern Montana	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total	29.3	29.3	29.3	34.6	51.1	60.0	53.9	87.8	105.9
Powder River Basin									
Montana	53.9	56.6	79.3	57.2	109.4	176.4	98.4	211.3	385.0
Wyoming	133.5	136.6	142.3	148.6	185.1	235.8	161.0	279.5	388.8
Total	187.4	193.2	221.6	205.8	294.5	412.2	259.4	490.8	773.8
Rest of Wyoming	55.3	57.8	66.7	59.5	71.4	81.6	74.1	104.4	130.1
Colorado	33.8	33.9	38.2	28.3	35.1	43.3	35.0	49.3	59.9
Utah	25.1	30.2	35.1	35.9	48.8	63.)	49.2	74.2	82.6
New Mexico	33.3	37.7	44.2	55.9	64.1	67.4	61.0	71.8	77.4
Central West	15.0	15.2	16.7	14.8	21.5	26.9	18.3	32.7	44.7
Gulf	69.7	69.7	70.1	121.9	151.6	209.7	161.7	213.5	213.5
Arizona	12.1	12.1	12.1	11.2	11.6	11.6	11.2	11.5	11.8
Northwest	3.4	4.2	3.7	4.7	5.3	6.2	5.4	6.7	7.2
Alaska	b	b	b	b	b	1.9	b	3.8	5.-
TOTAL	464.4	483.3	537.7	572.6	755.0	983.8	729.2	1146.5	15.2.6

[a]Some totals differ slightly from corresponding totals in Table 4 due to rounding.
[b]Negligible

Source: U.S. Department of Energy, The 1980 Biennial Update of National and Regional Coal Production Goals for 1985, 1990, and 1995, March 1981.

Figure 2. DOI Coal Production Regions

Source: U.S. Department of Energy, The 1980 Biennial Update of National and Regional Coal Production Goals for 1985, 1990 and 1995, March 1981.

Table 6. Coal Production Goals for 1985, 1990, and 1995 by DOI Coal Production Regions (million short tons)

Region	1985			1990			1995		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
No. Appalachia	179.8	194.5	215.9	222.7	291.0	341.5	270.0	372.3	494.7
Cen. Appalachia	198.2	208.7	224.6	214.7	230.2	257.6	202.5	229.5	255.2
So. Appalachia	18.5	19.5	20.6	16.0	17.0	18.4	13.6	15.9	19.5
Eastern Interior	179.7	211.8	246.0	243.7	327.0	384.6	303.7	450.0	484.3
Western Interior	15.0	15.2	16.7	14.8	21.5	26.9	18.3	32.7	44.7
Fort Union	29.3	29.3	29.3	34.6	51.1	60.0	53.9	85.9	105.9
Powder River	187.1	193.2	221.6	205.8	294.3	412.2	259.1	490.9	773.8
Green River - Hans Fork	73.9	76.5	88.6	75.1	90.8	105.3	93.4	130.9	160.9
Uinta-S.W. Utah	36.4	41.4	47.1	45.8	60.5	76.7	60.8	89.2	101.2
Denver-Raton Mesa	5.3	6.3	7.8	4.2	10.5	14.3	7.4	18.4	24.2
San Juan River	31.9	35.4	40.7	54.5	57.6	58.9	57.6	61.2	63.7
Texas[a]	69.7	69.7	70.1	121.9	151.6	209.7	161.7	213.5	213.5
Total[b]	1024.8	1101.5	1229.0	1253.8	1603.1	1966.1	1502.0	2190.4	2710.6

[a] Includes Louisiana.
[b] Not equal to totals in Tables 4 and 5 because DOI regions do not cover all coal producing areas.

Source: U.S. Department of Energy, The 1980 Biennial Update of National and Regional Coal Production Goals for 1985, 1990, and 1995, March 1981.

Table 8. Comparison of DOE Coal Production Goals Issued in June 1978, April 1979 and December 1980; Medium Level (million short tons)[a]

Region	1985			1990		
	June 1978	April 1979	December 1980	June 1978	April 1979	December 1980
No. Appalachia	213.0	176.4	194.5	225.3	247.5	291.0
Cen. Appalachia	205.2	247.8	208.7	206.2	225.1	230.2
So. Appalachia	21.4	18.4	19.5	13.8	12.4	17.0
Total	439.6	442.6	422.7	445.3	485.0	538.2
Midwest	204.4	222.5	211.8	312.3	290.5	327.0
Total East	644.0	665.1	634.5	757.6	775.5	865.2
E. No. Gt. Plains	21.9	27.7	29.3	22.5	32.2	51.1
W. No. Gt. Plains	305.6	196.8	273.3	529.0	503.3	388.8
Total	327.5	224.5	302.6	551.5	535.5	439.9
Central West	10.6	11.9	15.2	10.3	11.9	21.5
Gulf	57.7	70.2	69.7	79.6	71.8	151.6
Rockies	43.8	35.1	41.6	53.3	41.2	60.8
Southwest	28.3	19.7	49.8	65.0	22.8	75.7
Northwest	4.4	6.1	4.2	3.7	6.1	5.3
Total	144.8	143.0	180.5	211.9	153.8	314.9
Total West	472.3	367.5	483.4	763.4	689.3	754.8
TOTAL U.S.	1116.3	1032.6	1117.9	1521.0	1464.8	1620.0

[a]No comparison is presented for 1995 due to the fact that the present update represents the first attempt to develop goals for that year.

Source: U.S. Department of Energy, The 1980 Biennial Update of National and Regional Coal Production Goals for 1985, 1990 and 1995, March 1981.

Table 10. Comparison of Coal Production Goals to Selected State Production Forecasts for 1985 and 1990 (million short tons)[a]

State	Actual 1979	1985				1990			
		State Forecast	Goals			State Forecast	Goals		
			Low	Medium	High		Low	Medium	High
North Dakota	15.0	38.7	29.0	29.0	29.0	71.1	34.3	50.8	59.7
Montana	32.5	81.2	54.2	56.9	79.6	130.2	57.5	109.7	176.7
Wyoming	71.8	146.5	188.8	194.4	209.0	167.5	208.1	256.5	317.4
Colorado	18.1	23.9	33.8	33.9	38.2	n.a.	28.3	35.1	43.3
New Mexico	15.1	47.0	33.3	37.7	44.2	57.5	55.9	64.1	67.4
Utah	11.8	18.0	25.1	30.2	35.1	28-44	35.9	48.8	63.0

[a]State forecasts are not available for 1995.

Source: U.S. Department of Energy, The 1980 Biennial Update of National and Regional Coal Production Goals for 1985, 1990, and 1995, March 1981.

U.S. Department of the Interior, Bureau of Land Management, Final Environmental Statement, Star Lake Bisti Regional Coal Development.

ESTIMATED COAL PRODUCTION
(thousands of tons)

Level of Production	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Low Level[1]	4,680	8,029	9,418	9,705	9,945	10,235	10,415	10,315	10,115	9,915	9,465	9,410	9,410
Intermediate Level[2]	4,680	8,029	9,618	10,005	10,445	11,435	12,715	13,715	13,615	13,415	12,965	14,310	14,510
Mid Level[3]	4,680	8,029	12,160	15,705	19,145	24,025	28,215	28,215	28,115	28,915	29,465	30,810	31,010
High Level[4]	4,680	10,029	14,160	20,705	30,145	37,235	44,415	46,715	50,915	52,065	54,465	57,710	75,410

ESTIMATED EMPLOYMENT

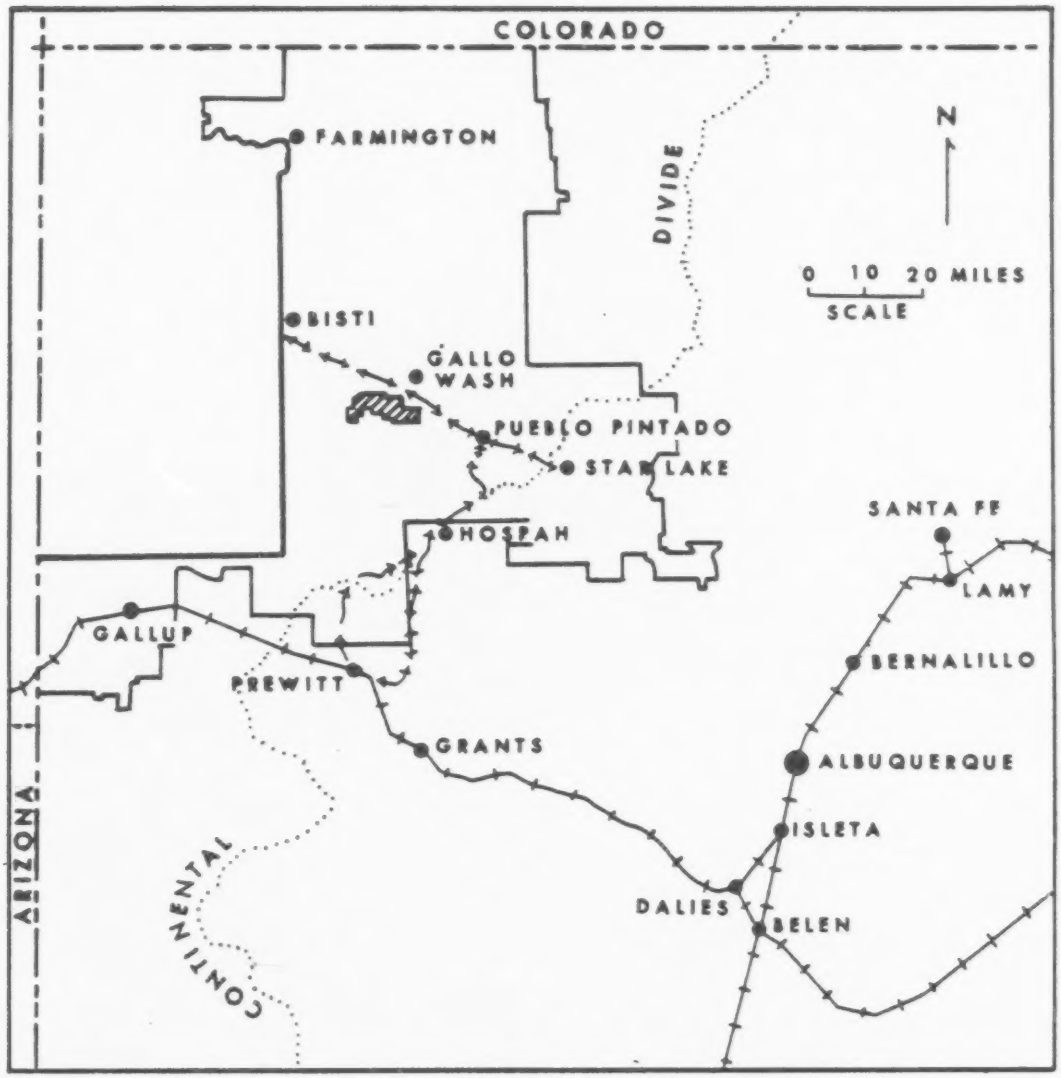
Alternative of Development	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
No-Action Alternative[1]	1,555	1,745	1,591	1,242	1,219	1,269	1,299	1,299	1,299	1,274	1,274	1,274	1,274
Partial-Action Alternative[2]	1,555	2,117	2,601	2,878	2,695	1,755	1,815	1,965	3,253	3,040	3,529	3,964	3,663
Proposed Action[3]	1,580	2,380	3,227	3,856	3,222	2,484	2,697	3,357	4,095	4,5[illegible]	4,90[illegible]	4,836	4,535
Full-Development Scenario[4]	1,685	2,582	3,675	4,526	4,287	4,043	4,342	[illegible]	6,170	6,013	6,794	7,[illegible]28	7,[illegible]37

[1] Includes existing mines, mining of State and privately owned coal for which proposals have been submitted, mining of coal on existing Federal leases that does not need railroad or transmission line, and expansion of the San Juan Generating Station.

[2] Includes all of the above plus the Western Bisti Mine, the New Mexico Generating Station and the Fruitland Coal Load Transmission Line.

[3] Includes all of the above plus the Star Lake Railroad, and the mines that would depend on the proposed actions.

[4] Includes all of the above plus mining of all coal in the ES Region in which an interest has been expressed.



LEGEND

- CHACO CANYON NATIONAL MONUMENT
- BORDER OF ENVIRONMENTAL STATEMENT REGION
- AT&SF MAIN LINE RAILROAD
- PROPOSED RAILROAD LINE
- ALTERNATE RAILROAD LINE

LOCATION OF PROPOSED STAR LAKE RAILROAD.

COAL TRAFFIC OVER THE PROPOSED LINE BY
1990 FOR THE MID-LEVEL OF COAL PRODUCTION

Mine	Annual Tonnage (Thousand Tons)	Equivalent Unit Trains Per Year	Destination
South Hospah	3,500	350	Colorado City, Grandbury and Monahans, TX
Star Lake	7,000	700	
Alamito	6,000	600	Springerville, AZ

RIGHT-OF-WAY REQUIREMENTS BY CATEGORY
OF PRESENT LANDOWNER

Present Owner or Administrator	Right-of-Way Requirements (acres)
Bureau of Land Management	289.6
Bureau of Indian Affairs (PLO 2198)	231.3
State of New Mexico	286.6
Indian allotment lands	616.7
Navajo Tribal fee lands	378.0
Navajo Tribal trust lands	58.2
Private ownership	993.6
	2,854.0

Source: The Atchison, Topeka and Santa Fe Railway Company, 1978.

PROPOSED NEW MEXICO COAL PRODUCT BY COMPANY THROUGH THE YEAR 2000
(exclusive of 1976 base of 9,980,323 short tons)

	1977	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000
Amoral	.16	.16	.16	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30										
Arch MU I					3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
MU II								3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Carbon Coal			1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6											
Chaco Energy																								
Star Lake				2.0	3.2	3.2	5.1	6.0	6.0	6.0	7.0	7.0	7.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Gallo Wash									2.0	3.2	3.2	5.1	5.1	5.1	5.1	6.0	6.0	6.0	8.0	8.0	8.0	8.0	8.0	8.0
Consolidation Coal											3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Eastern Assoc.						2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Freeman United						2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Kaiser-Steel			.5	.5	.5	.5	.5	.5	.5	.5	.5	.5												
Peabody																								
Star Lake East							.2	.2	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
Gallo Wash										.2	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
Pittsburg-Midway	1.2	2.5	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Salt River Project										2.9	2.9	2.9	2.9	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Western Coal																								
Bisti					.3	3.0	3.0	3.0	3.0	3.0	3.0	6.0	6.0	9.0	9.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
San Juan Underground				.3	.75	1.55	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Consolidation Coal/ El Paso Natural Gas	.30	.75	1.0	4.3	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Tucson Gas & Electric									1.8	1.8	1.8	3.5	3.5	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Annual Total	1.4	3.0	7.0	10.7	19.0	28.1	31.6	35.5	34.6	43.1	48.2	54.8	54.8	59.7	59.9	63.8	63.8	63.8	65.8	65.8	65.8	65.8	65.8	65.8

Source: New Mexico's Energy Resources, 1977, by Office of the State Geologist

New Mexico State Rail Plan, 1979

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Summary of Employment, for each Coal Mine

Pittsburg and Midway-McKinley Mine: 340 employees in 1979, 75% Navajo

Carbon Coal-Mentmore Mine: 250 full-time employees (according to company) and 220 (according to State Mine Inspector)

Amcoal Inc.-Amcoal #1: 30 in 1980; up from 26 in 1979

Utah International-Navajo Mine: 507 in 1980 and 1979, 75% Indian

Consolidation Coal-Burnham Mine: 30 employees at start-up, 300 by the time full production is achieved.

Western Coal-San Juan Mine: 130 employees (of Utah Int'l.) in 1979

Kaiser Steel-York Canyon: 397 employees in 1978, in 1979.

Cactus Industries-Tres Hermanos: 5 employees at present.

For planned mines:

Chaco Energy-South Hospah: 200 employees at time of max. production

Chaco Energy-Star Lake: 240 employees initially, to increase later.

Alamito Coal-Gallo Wash: 300 employees at full production, many of these to be Navajo.

Sunbelt Mining-San Juan Underground and De-Na-Zin: 45 employees to recover 490,000 tons/yr.; 20-25 employees for 250,000 tons/year.

Western Coal-Bisti Mine: 250 to 300 employees at production of 5 mil. tons/yr.

Western Coal-La Plata Mine: 50 employees

Ideal Basic Coal-La Ventana: Up to 140 employees the first year, and 435 by eighth year, when full production achieved.

Source: State of New Mexico, Energy and Minerals Department, Mining and Minerals Div.